

# MAHARASHTRA ENERGY DEVELOPMENT AGENCY (MEDA)

## STRATEGIC ENERGY CONSERVATION PLAN

### FINAL REPORT

*Prepared by*



**I I E C**

*International Institute for Energy Conservation*

Under

**USAID ECO II Program**



**USAID | INDIA**  
FROM THE AMERICAN PEOPLE

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## EXECUTIVE SUMMARY

### A. INTRODUCTION

To encourage and promote the efficient use of energy, the Government of India (GOI) has enacted the Energy Conservation Act 2001 ("EC Act") and has established the Bureau of Energy Efficiency (BEE) in the Ministry of Power as the nodal Central Government agency responsible for spearheading the improvement of energy efficiency through a combination of regulatory and promotional programs. The Act recognizes the need for a strong and vigorous decentralized approach at the state level and provides for the establishment of state energy conservation agencies to plan and execute these programs. The Government of Maharashtra has designated the Maharashtra Energy Development Agency (MEDA) as the nodal agency for energy conservation with responsibility to coordinate, regulate and enforce the provisions of the EC Act in Maharashtra. In addition, MEDA has been assigned the responsibility of developing a strategic plan for energy conservation for Maharashtra. The U.S. Agency for International Development, India Mission (USAID/India), as a part of its Energy Conservation Commercialization (ECO) Program, provided technical assistance (TA) to MEDA in the development of the Strategic Energy Conservation Plan. This report presents the results of the TA efforts carried out by the International Institute for Energy Conservation (IIEC) under a Cooperative Agreement with USAID.

### B. OBJECTIVES

The principal objective of this project was to assist MEDA in the development of the Maharashtra State Strategic Energy Conservation Plan, including:

- Review of prior MEDA EC activities and the work performed for MEDA by the National Productivity Council (NPC)
- Establishment of an Advisory Panel
- Development of the framework for a Strategic Plan and a two-year Action Plan
- Assistance to MEDA in establishing and interacting with the State Energy Conservation Advisory Committee
- Identifying specific EC program options and developing the designs of the EC programs to be included in the Action Plan.

### C. APPROACH

MEDA was established by the Government of Maharashtra in 1985 to undertake development of renewable energy and facilitate energy conservation in the State of Maharashtra. After the passage of the EC Act, MEDA was designated by GoM as the state agency responsible to carry out the provisions of the EC Act. In 2003 MEDA established the Energy Conservation department and initiated a number of activities including State level energy conservation awards, the Save Energy Program for energy audits, empanelment of energy consultants and auditors, development of Energy Conservation Tips, cooperative activities with the Alliance to Save Energy (ASE) and U.S.-Asia Environmental Partnership (US-AEP) for municipal energy audits, and organization of various energy conservation events in Maharashtra. MEDA also engaged the National Productivity Council (NPC) to develop a preliminary Energy Conservation Action Plan.

In 2004 MEDA entered into a cooperative agreement with the International Institute for Energy Conservation (IIEC) for energy conservation program implementation under the USAID Energy Conservation and Commercialization (ECO II) program. The ECO II program is targeted at promoting the widespread commercialization of energy efficiency technologies and services in India, which would have a direct impact on the reduction in growth of greenhouse gas (GHG) emissions. The project supports the development of policy and market interventions that would enhance the capabilities of the private, financial, and government sectors for deploying market-based mechanisms for end-use efficiency investments. Recognizing that substantial additional work was needed to refine, expand and modify this initial draft of the EC Action Plan MEDA requested USAID to assist in the preparation of a Strategic EC Action Plan.

IIEC worked closely with MEDA and conducted the following activities:

- Review of the NPC study
- Establishment of an Energy Conservation Advisory Panel
- Assistance to MEDA in empanelling a State Energy Conservation Committee
- Development of a strategic framework for the EC Action Plan
- Design of specific energy conservation programs
- Definition of the need for and options for establishing an Energy Conservation Fund
- Specification of the approach to develop the databases needed to support the EC programs
- Definition of capacity building needs
- Preparation of this Plan document.

The draft of the Plan was presented and discussed at a meeting involving representatives of various State Government agencies in Mumbai in February 2005. It has also been reviewed with the Energy Secretary at a meeting in February 2005, and comments and suggestions made at these meetings have been incorporated in this Final report.

## **D. OVERVIEW OF THE STRATEGIC ENERGY CONSERVATION PLAN**

The MEDA Strategic Energy Conservation Plan has been developed as a blueprint for energy conservation activities in the State of Maharashtra, consistent with MEDA's responsibilities as the designated agency for the implementation of the Energy Conservation Act 2001 and the needs to develop mechanisms to balance the State's electricity supply and demand.

### ***Mission***

The mission of the State Energy Conservation Plan is:

***To develop a comprehensive approach and provide leadership in establishing and promoting the energy conservation ethic within government agencies and all consumer classes in the State of Maharashtra, while maximizing the participation of the private sector in the implementation of energy conservation activities.***

### ***Objectives***

The major objectives of the Strategic Energy Conservation Plan are to:

- Achieve substantial reductions in energy consumption and peak loads
- Balance energy supply and demand with maximum resource efficiency and reduce power shortages
- Create macro-economic and fiscal benefits to the state

- Implement cost-effective programs to enhance energy efficiency (EE) and load management (LM)
- Provide consumer information and education
- Promote private sector activities for implementation of energy conservation programs
- Protect and enhance the local, national and global environment
- Reduce long-term cost of electricity
- Reduce capital requirements for capacity expansion

The Strategic Energy Conservation Action Plan includes the following key elements:

- Statutory responsibilities of MEDA under the EC Act
- Implementation of a set of Energy Conservation Programs
- Establishment of an Energy Conservation Fund
- Development of databases and promotional campaigns
- Capacity building for development, implementation and evaluation of energy conservation programs

Section 4 of this report provides the presents the summary of the Strategic Energy Conservation Plan.

#### **E. Statutory Responsibilities of MEDA**

As the designated agency for the implementation of the EC Act 2001 in Maharashtra, MEDA is mandated to carry out certain specific statutory responsibilities. To meet these responsibilities, MEDA shall conduct the following roles and functions:

- **As a Development Agency**
  - Prepare energy use data banks for various categories of consumers.
  - Formulate state policies and programs on energy efficiency.
  - Promote energy efficiency through targeted awareness programs and energy efficiency awards, and through publicity and advertisements for mass campaigns
- **As a Facilitator**
  - Co-ordinate with BEE in implementing EC Act & EE programs.
  - Assist BEE in conducting energy managers' training and examinations.
  - Promote energy efficiency through pilot/demonstration EE-DSM programs in association with utilities companies.
  - Co-ordinate with MERC for promoting energy efficiency through utility companies.
  - Assist state government in establishing an Energy Conservation Fund.
  - Evolve instruments and delivery mechanism for implementing EE/DSM programs.
  - Promote private and public partnership in efficient use of energy.
- **As a Regulatory Agency**
  - Amend building codes as developed by BEE, to suit local requirements and enforce within the state.
  - Ensure all designated consumers have appointed certified energy managers.
  - Intimate all designated consumers about mandatory energy audit and ensure that mandatory energy audits are carried out once in 3 years.

- Obtain action taken report from designated consumers.
- Prescribe energy conservation norms in manufacturing
- Prescribe energy consumption standards for specific equipments
- Direct mandatory display of labels on specified equipments.
- Prohibit manufacture or sale or purchase or import of such specified equipments not confirming to energy consumption standards.
- **As a Coordinator with the Bureau of Energy Efficiency.**
  - Public awareness about EE products through media.
  - Adaptation and implementation of building codes.
  - Co-ordination with BEE regarding approved EE labels and products.
  - Development of energy indicators for equipments, appliances and building (based on declared energy consumption data).
  - Feedback to BEE on labeling and penetration of EE products.
  - Role of SSIs in manufacturing EE products.
  - Maintaining approved manuals and codes for EE products.
  - Establishing EE product testing facilities.

Section 5 of this report presents the statutory responsibilities, roles, and functions of MEDA as the designated energy conservation agency.

## F. ENERGY CONSERVATION PROGRAMS

To achieve the objectives of the Strategic Energy Conservation Plan, MEDA will develop and implement a set of proactive energy conservation programs. These programs will be implemented in cooperation with relevant state government agencies and the private sector.

MEDA has developed the preliminary designs of 11 energy conservation programs, three of which will be implemented in 2005 and the other eight in 2006. A list of the programs is provided below.

### ***PROGRAMS TO BE IMPLEMENTED IN 2005***

1. **HOME BRIGHT** – Residential High-Efficiency Lighting Program
2. **PUBLIC BUILDINGS PARTNERSHIP PROGRAM** – Energy efficiency implementation in public buildings using ESCOs as the implementing mechanism
3. **SOLAR/LPG WATER HEATING** – Integrated Solar/LPG Water Heating Program



**PROGRAMS TO BE IMPLEMENTED IN 2006**

4. **SME PROGRAM** – Energy efficiency improvement in small and medium enterprises
5. **WORK BRIGHT PROGRAM** – Commercial High-Efficiency Lighting Program
6. **MOTOR RE-POWER** – High Efficiency Motor Rewinding Program
7. **EE FINANCING** – Financing of energy efficiency improvement using the Energy Conservation Fund
8. **AGRICULTURAL EFFICIENCY** – Energy efficiency improvement in agriculture
9. **BRIGHT STREETS** – Municipal Street Lighting Program Using advanced technology
10. **GREEN BUILDINGS PROGRAM** – Green Buildings Program - Cooperate with existing Green Buildings Center; Construct one or two new Green Buildings in Maharashtra
11. **MUNICIPAL ENERGY EFFICIENCY PROGRAM** – Improvement of energy efficiency in municipal water pumping and street lighting

For each of these programs, Section 6 provides a detailed description of the following:

- Background
- Rationale
- Program Objectives
- Program Design
- Target Market Segments
- End Uses Targeted
- Key Barriers Addressed
- Technologies to be Employed
- Marketing Strategy
- Program Start Date
- Program Duration
- Financing Approach
- Anticipated Results
- Program Costs
- Program benefits
- Institutional Relationships
- Implementation Responsibilities
- Key Action Steps

#### **G. ESTABLISHMENT OF AN ENERGY CONSERVATION FUND**

Many financial barriers have limited the implementation of energy efficiency activities by energy consumers in Maharashtra. Recent efforts to identify and address these barriers have concluded that there is a need for an Energy Efficiency Fund that will facilitate the development and growth of an energy efficiency infrastructure that includes energy service providers such as ESCOs to help energy

consumers develop and implement cost-effective EE projects. MEDA has developed the rationale and justification for the Maharashtra Energy Conservation Fund (EC Fund), and defined the purpose and benefits of the Fund, the funding sources, use of the funds, fund management and administration, and eligibility for receiving funding for EE projects.

Section 7 describes:

- The state responsibilities under the EC Act to establish an Energy Conservation Fund (EC Fund)
- The rationale and justification of the EC Fund
- The purpose and benefits of the EC Fund
- Initial funding sources
- The use of the EC fund
- Fund management and administration options
- Establishment of qualifications for project financing using the EC Fund

## **H. DEVELOPMENT OF DATABASES AND PROMOTIONAL CAMPAIGNS**

As part of the Strategic Energy Conservation Plan, MEDA shall develop a set of databases to support the development and implementation of EC programs, and launch a general information and education campaign to promote energy conservation activities.

The databases include the following:

- Database of large energy users
- Energy consumption and end use database
  - Residential
  - Commercial
  - Industrial
  - Government buildings
  - Municipal
  - Agricultural
- Load shapes database
- Database on energy efficiency technologies
- Database of certified energy users and managers
- Database of major stakeholders

The information and education campaign will include:

- Energy Conservation Awards
- Annual Energy Conservation Conference
- Awareness Program for Government Departments
- Awareness Program for Industry
- Awareness Program for Buildings and Commercial Establishments
- Identifying and Training Local Service Providers at the District Level
- Development of District Energy Conservation Committees

Section 8 provides a description of the needed databases defining for each database - the type of database, rationale for development, information to be included, method of development, method of updating, and frequency of updating. Section 8 also includes the descriptions of the information and awareness campaigns.

## I. CAPACITY BUILDING

MEDA, in its role as the designated agency for energy conservation in the state, is expected not only to manage programs at the design, scoping, launch, implementation and monitoring stages, but also to promote business models of private sector energy service delivery. The planned Capacity Building program under the EC Plan addresses the needs of organizations expected to work with MEDA in program implementation. Specifically, capacity building of the energy auditors and energy services companies certified by MEDA will be a part of the capacity building initiative. In order to ensure a long-term capacity building initiative, the plan also includes collaboration with the Bureau of Energy Efficiency (BEE), Indian Institute of Technology-Bombay (IIT-B) and the National Productivity Council (NPC) in their role as trainers.

Section 9 addresses the capacity building needs. The specific topics covered in the Capacity Building Program include load research, energy auditing of feeders, industries and businesses, market research, advertising and promotion, financial analysis, program management, and certification.

## J. PROGRAM RESULTS, COSTS AND BENEFITS

The 11 programs included in the Strategic Energy Conservation Plan will result in peak load savings of 1,117 MW and cumulative energy savings of 20,000 GWH over 10 years. The net program costs to MEDA will be Rs. 45.8 crores. The total equipment costs (which will be borne by the customers and the private sector) will be Rs. 2,887 crores. The energy savings benefits will be Rs. 5,480 crores and the capacity savings benefits Rs. 4,468 crores, adding up to total benefits of Rs. 9,948 crores. A summary of the program results, costs and benefits is provided below:

Item	Units	3-Year	10-Year
Equipment Costs	Rs. Crores	414.5	2,887.5
Program Costs (excl Equip)	Rs. Crores	20.4	40.0
Database & Promotion	Rs. Crores	2.4	4.5
Capacity Building	Rs. Crores	0.6	1.3
<b>Total Costs</b>	<b>Rs. Crores</b>	<b>437.9</b>	<b>2,933.3</b>
<b>MEDA Costs</b>	<b>Rs. Crores</b>	<b>23.4</b>	<b>45.8</b>
Energy Savings	GWH	907.6	20,298.5
Capacity Savings	MW	162.0	1,117.1
Energy Benefits	Rs. Crores	245.0	5,480.6
Capacity Benefits	Rs. Crores	648.1	4,468.3
<b>Total Benefits</b>	<b>Rs. Crores</b>	<b>893.1</b>	<b>9,948.9</b>

# 1. INTRODUCTION

## A. BACKGROUND

India's economy has experienced remarkable growth in the last 5 years, and is likely to continue to be one of the fastest growing in the world. In order to support the economic growth, substantial additional energy resources are needed. However, because investments in power generation, transmission, and distribution have not been able to keep up with the economic growth, India's electricity sector is characterized by problems of inadequate capacity, poor quality and reliability. Maharashtra, the leading industrial state in India and consumer of about 15% of the total electricity in the country, shares these problems. Current electricity shortages in Maharashtra are estimated to be 20% for capacity and 15% for energy. These shortages are especially detrimental to industry and commerce that have been the main engines powering economic growth and development since the liberalization in 1991. While it will be very difficult to solve the chronic inadequacies in electricity supply, it is likely that a major contribution can be made to reducing the supply-demand imbalance through the improvement of energy efficiency.

The energy consumption per unit of gross domestic product (GDP) in India and Maharashtra is very high compared to the U.S.A., the European Union, Japan, and even other Asian countries. The inefficiencies in India's existing energy utilization and the potential benefits of energy efficiency improvement have long been recognized and are very large. In 2001, the Government of India (GOI) enacted the Energy Conservation Act and established the Bureau of Energy Efficiency (BEE) in the Ministry of Power as the nodal Central Government agency responsible for spearheading the improvement of energy efficiency through a combination of regulatory and promotional instruments. The mission of BEE is to "institutionalize energy efficiency services, promote energy efficiency delivery mechanisms, and provide leadership to improvement of energy efficiency in all sectors of the economy."

While centralized planning and design of energy efficiency (EE) programs is being undertaken by BEE, it must be supported by a strong and vigorous decentralized program at the state level. Indeed, anticipating such a need, the Energy Conservation Act 2001 provided for the establishment of state energy conservation agencies to plan and execute programs. Many Indian states are comparable in population to European countries (and much larger than U.S. States), but until recently, hardly any attention has been devoted to developing a state energy conservation plan or strategy. While countries like France, Holland, Sweden or Germany in the European Union, and U.S. States such as New York and California, have effective energy efficiency programs reflecting their specific supply-demand situation, load profile and customer bases, Indian states have been far behind in even contemplating, leave alone implementing, alternatives to either state or centrally driven energy supply plans.

In response to the Energy Conservation Act 2001 (EC Act), the Government of Maharashtra has designated the Maharashtra Energy Development Agency (MEDA) as the nodal agency for energy conservation with responsibility to coordinate, regulate and enforce the provisions of the EC Act in Maharashtra. In addition, MEDA has been assigned the responsibility of developing a strategic plan for energy conservation for Maharashtra. The U.S. Agency for International Development, India Mission (USAID/India), as a part of its Energy Conservation Commercialization (ECO) Program, provided technical assistance (TA) to MEDA in the development of the Strategic Energy Conservation Plan. This report presents the results of the TA efforts carried out by the International Institute for Energy Conservation (IIEC) under a Cooperative Agreement with USAID.

## B. OBJECTIVES

The principal objective of this project was to assist MEDA in the development of the Maharashtra State Strategic Energy Conservation Plan, including:

- Review of prior MEDA EC activities and the work performed for MEDA by the National Productivity Council (NPC)
- Establishment of an Advisory Panel
- Development of the framework for a Strategic Plan and a two-year Action Plan
- Assistance to MEDA in establishing and interacting with the State Energy Conservation Advisory Committee
- Identifying specific EC program options and developing the designs of the EC programs to be included in the Action Plan.
- Assessment of options for the establishment of an Energy Conservation Fund to support the EC Action Plan

## C. MEDA ROLE IN ENERGY CONSERVATION

MEDA has been designated by the Government of Maharashtra (GoM) as the nodal agency for the implementation of the national Energy Conservation Act, 2001 (EC Act). The EC Action Plan will also include the establishment of a State-level Energy Conservation Fund (EC Fund) to finance energy conservation activities in Maharashtra.

Energy Conservation activities are not new to MEDA. An Energy Conservation Department was established in MEDA in 2003 with a staff of 7 reporting to the General Manager for Energy Conservation. The EC Department has been responsible for the following activities:

- State level energy conservation awards (“Award for Excellence in Energy Conservation and Management”) in the following categories: for industry, commercial building, government building, municipal corporation, MIDC, ESCO/energy audit firm, and individual
- Save Energy Program for energy audits which has been implemented in 379 industrial units
- Empanelment of energy consultants and auditors
- Development of Energy Conservation Tips for the industrial, domestic and agricultural sectors, for passive solar architecture, solar passive design and vehicle efficiency
- Cooperative activities with the Alliance to Save Energy (ASE) and U.S.-Asia Environmental Partnership (US-AEP) for municipal energy audits
- Cooperative activities with the International Institute for Energy Conservation (IIEC) for DSM program implementation under the USAID ECO-II program
- Organization of various energy conservation events in Maharashtra.

After it was designated the nodal agency for implementing the EC Act, MEDA retained the National Productivity Council (NPC) to develop an initial draft of the EC Action Plan. However, substantial additional work was needed to refine, expand and modify this initial draft and prepare a “model” EC Action Plan.

## D. THE NPC REPORT

In 2003, MEDA requested the National Productivity Council (NPC) to develop an initial version of the Energy Conservation Action Plan. NPC’s scope included the following activities:

- Identify possible focus/thrust areas of the Action Plan as per the EC Act-2001.

- Prepare strategic plan for implementing EC Act.
- Suggest measures for demand savings of around 1000 MW based on present energy usage in the state of Maharashtra.
- Highlight the roles and responsibilities of MEDA, BEE, Government of Maharashtra and Stakeholders as per the EC Act.
- Identify the capacity building requirement of MEDA in implementing EC Act.
- Assess the financial requirements and the possible revenue through implementation of EC act and Energy Efficiency programs.

NPC produced a draft report in January 2004 and, after receiving comments from MEDA and other reviewers, submitted the final report in March 2004.

## **E. THE USAID ECO II PROJECT**

The USAID/India initiated the Energy Conservation and Commercialization (ECO) project in 2000 aimed at promoting the widespread commercialization of energy efficiency technologies and services in India, which would have a direct impact on the reduction in growth of greenhouse gas (GHG) emissions. The project supports the development of policy and market interventions that would enhance the capabilities of the private, financial, and government sectors for deploying market-based mechanisms for end-use efficiency investments. In 2001, the Government of India passed the Energy Conservation Act and established a statutory coordinating body under the Central Government, the Bureau of Energy Efficiency (BEE). The BEE was officially established in March 2002, and the BEE Action Plan was subsequently approved and released in August 2002. Many of the areas addressed under ECO, as well as the contributions of other donors, are helping the BEE to implement their Action Plan.

In 2003, USAID initiated the second phase of ECO project (ECO II). The International Institute for Energy Conservation (IIEC) was commissioned by USAID under a Cooperative Agreement to assist BEE and state agencies in implementing energy efficiency programs. The major activities under ECO II include:

- Implementation of Demand-side Management (DSM) programs in State Utilities (Maharashtra and Karnataka)
- Development of a Best Practices Guide for DSM programs
- Development of energy efficiency building codes for different climatic regions

During the implementation of energy conservation activities in Maharashtra, USAID received a request from the Maharashtra Energy Development Agency (MEDA) to provide assistance in the development of an Energy Conservation Action Plan (EC Action Plan) and design of a State Energy Conservation Fund for Maharashtra. This assistance was provided by IIEC and included the following:

### ***Review of NPC Report***

IIEC reviewed the initial draft of the EC Action Plan prepared by NPC and assessed this draft to determine what additional work was needed to develop a “model” plan that will provide a “blueprint” for energy conservation activities in Maharashtra. Detailed comments were provided to NPC based on this review.

### ***Establishment of Advisory Panel***

IIEC established an Advisory Panel of national and international experts in energy conservation planning and financing. The members of this Panel include:

- USAID representatives – Mr. S. Padmanaban and Dr. Archana Walia
- US-AEP representatives – Mr. Sunil Parasnis and Ms. Nutan Zarapkar
- Dr. Brahmanand Mohanty – International Consultant

- Dr. Rangan Banerjee – Professor, I.I.T. Bombay
- Mr. Sunil Kulkarni – Financial Consultant
- Mr. Shishir Athale – Energy Consultant
- MEDA representatives – Mr. S.R. Choudhary and Mr. D.V Khandare
- NPC representative – Mr. B. Sadananda
- IIEC team members – Mr. Dilip Limaye, Mr. Mahesh Patankar, Mr. Felix Gooneratne and Dr. Nitin Pandit

A meeting of this Advisory Panel was held in Mumbai on February 25, 2004 to review and comment on the NPC draft, to define the objectives, content and structure of the EC Action Plan, and to develop a strategy for preparing the Plan. Individual members of the advisory Panel have contributed significantly to the design of the EC programs presented in this report.

### ***Review of State EC Action Plans from Other Countries***

IIEC identified and reviewed energy conservation action plans from other countries and states that are relevant to the development of an EC Action Plan for Maharashtra.

### ***Development of Framework for EC Action Plan***

In cooperation with the Advisory Panel and MEDA, IIEC developed an overall framework for the EC Action Plan for Maharashtra. This Framework included the identification of the key barriers to EC implementation, the major end-use sectors relevant to Maharashtra, the assessment of the barriers against the sectors, and the identification of potential programs. Also included in the Framework was an approach for the definition of key institutional relationships needed for successful implementation of the EC Plan.

### ***Program Design***

In cooperation with the Advisory Panel and MEDA, IIEC developed the preliminary designs of the EC programs to be included in the EC Plan. Each program design will include the following:

- Background
- Rationale
- Program Objectives
- Program Design
- Target Market Segments
- End Uses Targeted
- Key Barriers Addressed
- Technologies to be Employed
- Marketing Strategy
- Program Start Date
- Program Duration
- Financing Approach
- Anticipated Results
- Program Costs
- Program benefits
- Institutional Relationships
- Implementation Responsibilities
- Key Action Steps



## F. STRUCTURE OF THE REPORT

Following are the main sections in the report and a brief summary of their contents:

**Section 2: MEDA Background and Overview** – an overview of MEDA’s structure, functions and a summary of its current EC activities

**Section 3: Maharashtra Electricity System Characteristics** - the key characteristics of the electricity system in Maharashtra including generation, demand, energy sales, customer characteristics, regulations and tariffs.

**Section 4: Strategic Energy Conservation Plan** - an overview of the statutory responsibilities of MEDA under the EC Act and the energy conservation programs to be implemented as a part of the Plan. It also discusses the options for the establishment of an Energy Conservation Fund for Maharashtra.

**Section 5: Statutory Responsibilities of MEDA** - an overview of the EC Act 2001, provisions for State governments and the roles of MEDA under the Act.

**Section 6: Energy Conservation Programs** – a description of the proposed EC programs in all sectors.

**Section 7: Maharashtra Energy Conservation Fund** – the rationale and justification for the fund, funding sources, fund management and administration.

**Section 8: Development of Databases and Promotional Campaigns** – the details of proposed databases for major end-users, end-use sectors, load shapes, EE technologies, energy service providers and stakeholders. In addition, details of proposed education and information programs are provided.

**Section 9: Capacity Building** – an outline of the proposed capacity building programs for MEDA for implementation of the Strategic Plan, resource requirements and implementation plan.



## 2. MEDA BACKGROUND AND OVERVIEW

### A. INTRODUCTION

In response to the energy crisis in the 1970s, the Government of India created an independent ministry for renewable energy, the Ministry of Non-conventional Energy Sources (MNES) in the early 1980s. In line with the Central Government policy, GoM created Maharashtra Energy Development Agency (MEDA). Registered as a Society on 26 July 1985, MEDA as an organization commenced functioning from July 1986. MEDA's objective is to undertake development of renewable energy and facilitate energy conservation in the State of Maharashtra, as a state nodal agency under the umbrella of the MNES. The controlling body of MEDA is the governing body with the Hon. Minister for Energy, Maharashtra State, as Chairman and the Hon. Minister of State for Energy as Vice-Chairman. For about a decade since its establishment, MEDA did extensive work in the field of renewable energy focusing on rural areas and stand-alone devices with the Integrated Rural Energy Planning (IREP) program, the main plank of its activities.

In the past few years, technologies of generation of grid-connected power from renewable sources have been maturing and becoming popular in India. With participation of the private sector, MEDA has been able to facilitate establishment of about 400 MW of installed capacity in wind power generation at 11 different locations in Maharashtra. In the last two years, MEDA has also initiated establishment of power projects with other renewable sources of energy. Bagasse based cogeneration and power projects based on other agricultural waste like rice husk, generation of power from industrial and urban waste etc., are other areas in which significant advancement have been made.

MEDA has undergone organizational restructuring in the past two years from a largely rural "Stand Alone System" oriented organization to a significant player in the field of generation of power from renewables. Generation of power from environment friendly resources has become the need of the hour. The Government of India has accordingly adopted a target of 10 % of the additional power capacity established in the next 10 years from renewable sources. MEDA has prepared a 10 year plan called "MEDA Perspectives Plan 2012" with the help of The Energy and Resources Institute (TERI), New Delhi. In Maharashtra, the current annual estimated CO<sub>2</sub> emission from industry and from the use of fossil fuels is in the order of 110 Million tons. The interventions proposed in the MEDA Perspective Plan 2012, when implemented, would result in CO<sub>2</sub> mitigation in the order of 16 million tons annually from 2012.

### B. MEDA OBJECTIVES

The primary objectives of MEDA are to:

- Promote, develop and implement non-conventional, renewable and alternate energy devices and technologies.
- Take concrete steps for conventional energy conservation measures in industries, commercial establishments and domestic sectors.
- Assist the Government of India and Government of Maharashtra in renewable energy program implementation.
- Evolve suitable alternatives to meet the burgeoning energy demand.
- Install demonstration power projects with own investment to instill confidence in new entrants and private investors.
- Pursue power projects based on renewable energy with large-scale private investments in commercially viable projects by creating suitable policy environment.

- Information dissemination and public awareness through training programs, publications, exhibitions, seminars and conferences.
- Support large-scale distribution and marketing of stand-alone renewable energy devices by participating in field viability and commercialization exercises through innovative financing mechanism and creating investment opportunities.

### **C. MEDA PERSPECTIVES PLAN 2012**

MEDA's long-term plan, "MEDA Perspectives 2012" is based on an integrated approach, developed by MEDA in cooperation with TERI. This Plan envisages the addition of the following by 2012:

- Renewables based grid connected power: 2450 MW
- Solar water heating systems: 4,35,000 m<sup>2</sup>
- Solar concentrators for medium temperature applications: 15,000 m<sup>2</sup>
- Solar cookers: 1,10,000
- Solar PV systems for homes: 65,000
- Wind-solar hybrid systems for off-grid applications: 2.5 MW
- Energy conservation in 3819 industrial units
- Electricity demand saving in different sectors : Total 3000 MW

### **D. DESIGNATION OF MEDA AS THE NODAL AGENCY FOR ENERGY CONSERVATION**

The Government of Maharashtra, in exercise of the powers conferred under clause (d) of section 15 of the Energy Conservation Act (Central Act no.52 of 2001), has designated the MEDA as "The Designated Agency" to coordinate, regulate and enforce the provisions of the Act, and also to implement Schemes under the said Act within the State of Maharashtra (vide G.R. No. ESA 1002/CR-8192-NRG-5 dated 12th March, 2003). . This is a significant step forward for MEDA, who as the state nodal agency for renewable energy, now has the additional responsibility of promoting and developing energy efficiency.

### **E. PRIOR AND CURRENT MEDA ACTIVITIES RELATED TO ENERGY CONSERVATION**

#### ***Draft EC Plan and State Energy Conservation Committee***

To meet the objectives of MEDA's role as the designated agency for Energy Conservation, the organization recently established a separate department for Energy Conservation. An initial draft of an Energy Conservation Action Plan has been prepared by National Productivity Council (NPC), Mumbai. This Action Plan aims at peak demand saving of 1000 MW energy by the year 2012. The Government of Maharashtra (GoM) has given permission to MEDA to form a State Level Energy Conservation Committee to provide policy guidance to GoM/MEDA in the development and implementation of energy conservation programs.

#### ***USAID ECO II Activities***

MEDA has entered into an agreement with the International Institute for Energy conservation (IIEC) under the ECO II program for technical co-operation in the field of Demand Side Management demonstration projects. Under this agreement, MEDA has initiated energy conservation measures in a water supply scheme for Nashik Municipal Corporation.

### ***Government Buildings Energy Consumption Database***

During the International Convention on Energy Conservation, the Hon. Prime Minister, in his inaugural speech, outlined the aim of 30% energy saving in government buildings and institutes. The GoM Secretary Energy has highlighted the need for energy conservation in government buildings in the state. In response, MEDA has initiated a public sector program and currently collecting baseline information from MSEB, Zilla Parishads, all government buildings and grampanchyats.

### ***Energy Conservation Week***

MEDA actively participates in the annual national Energy Conservation Week in December. During this week, MEDA publishes advertisements and articles on energy conservation in various newspapers, attend energy conservation programs organized by other institutes, and provide guidance to the industrial sector through seminars and training.

### ***Energy Conservation Awards***

As a policy initiative, MEDA instituted the first ever state level “Awards for Excellence in Energy Conservation and Management”, whereby energy intensive industries, commercial buildings, municipal corporations and energy conservation service providers (e.g. Energy Service Companies, Energy Auditors, NGOs, etc.), are recognized, encouraged and motivated to continue their commendable efforts in the field of energy conservation in the state. The first award ceremony was held on 17<sup>th</sup> January, 2004 presided by the Hon Minister of Energy, GoM.

### ***Solar Water Heating Systems***

In Maharashtra, more than 5600 families are using solar energy for meeting their hot water needs. In addition Solar Water Heating Systems (SWHS) are used widely in commercial sector, primarily in hotels and hostels. As of March 2004, the installed capacity of SWHS in Maharashtra was estimated to be 58,000 and this contributed to significant savings in the morning system peak demand. MEDA has submitted a detailed report to the GoM proposing changes to the relevant bye-laws for making SWHS mandatory within municipal limits. Once implemented, a peak load reduction of 11.70 MW and CO<sub>2</sub> emission reduction of 25,000 tons will be achieved annually. The estimated annual impact after 12 years include approximately 500 MW peak load shaving and 890,000 tons of carbon-dioxide emission reduction.

### ***The Save Energy Program***

MEDA has empanelled a group of energy consultants and auditors and has assisted industry and businesses in identifying energy efficiency opportunities by subsidizing energy audits. To date, 384 energy audits have been conducted.

### ***Pump Rectification Program***

It is estimated that there are around 22,000 irrigation pump sets in Maharashtra. Around 26% of the total electricity used is for running of these pump sets. Studies have shown that significant energy savings (25 to 30%) could be achieved through correct design and operation of irrigation pumps. Considering this vast potential of energy conservation, MEDA undertook a program, from 1989 to 1994, of pump set rectification in the agricultural sector in 17 different blocks of IREP of Maharashtra. Under this program, an average of 350 to 400 pump sets were rectified each year and financial assistance was provided for improving the energy efficiency through measures such as piping & footwall replacement.

### ***Other MEDA EC Activities***

Other energy conservation activities undertaken by MEDA include:

- Empanelment of Consultants
- Preparation of List of Energy Service Companies
- Preparation and Dissemination of Energy Conservation Tips
- Organization of Energy Conservation Events
- Pilot Programs for Energy Conservation

### 3. MAHARASHTRA ELECTRICITY SYSTEM CHARACTERISTICS

#### A. INTRODUCTION

Maharashtra is one of the largest states in the country with close to 3.08 Lakhs square kilometer of area coverage with a population density of 314 per sq. km<sup>1</sup>. Total population of 96,752,247 is divided in to 43.4% and 56.6% in urban and rural sector. Per capita income in the state is approximately Rs. 17,295 as compared to the national average of Rs. 10,771; this state contributes almost 14.7% of India's gross domestic product and 15.1% of the national income<sup>2</sup>. Evidently, the electricity supply in the industrial and domestic consumer sectors is important to the growth in the national income as it contributes to the production in the state and is likely to increase the purchasing power of the population, clearly indicated by the higher per capita income. In 1997, total installed capacity in the state of Maharashtra was 9538 MW, which was close to 11% of the installed capacity in the country<sup>3</sup>.

#### B. OVERVIEW OF ELECTRICITY SUPPLY

The electricity supply grid in Maharashtra is a part of the Western grid in the country and shares electricity with the neighboring Gujarat, Madhya Pradesh and Goa states. Maharashtra State Electricity Board (MSEB) is a state-owned electricity utility with generation, transmission, and distribution functions. MSEB is the largest and only state-owned electricity provider in Maharashtra with around 129.83 lakh customers in the state. Other consumers in the state are serviced by two private sector utilities Tata Power Companies (TPC) and Reliance Energy Limited (REL) (erstwhile BSES Ltd.) and a state government undertaking, the Bombay Electricity and Suburban Transport (BEST). The operations of TPC and REL include both power generation and distribution, while BEST is only a distribution utility. As of date, TPC, REL and BEST service consumers only in Mumbai and in some cases the neighboring industrial sector. In 2002-03, the total of electricity sold by MSEB was 41901 Million Units; that of TPC was 9122 Million Units and that of REL was 5880 Million Units, aggregating to the state-wide sale of 56903 Million Units<sup>4</sup>.

#### C. GENERATION CAPACITY

Primary electricity generation in the state is from MSEB, TPC and REL. Table 3.1 shows the installed generation mix of MSEB over the last three years (FY 2000-01, 2001-02 and 2002-03) and Figure 3.1 shows the annual generation over the same period. MSEB have not acquired new generation capacity since 2000.

<sup>1</sup> 2001 census (<http://www.censusindia.results>)

<sup>2</sup> Maharashtra Energy Development Agency 2020 Report – TERI Report No. 2001RT61

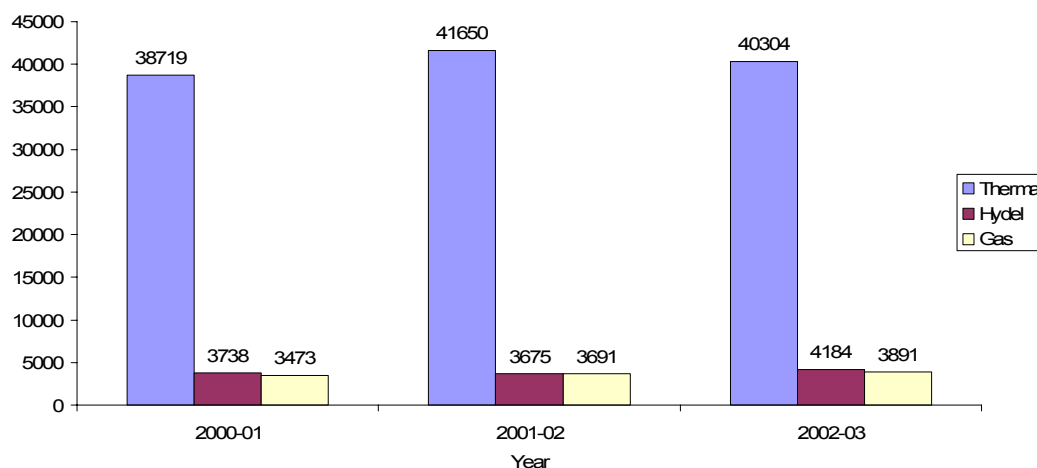
<sup>3</sup> Maharashtra Development Report (2004), IGIDR and IIT-Bombay

<sup>4</sup> MSEB Annual Report 2002-03 and MERC Tariff Orders for TPC and REL

Table 3.1 MSEB Generation Capacity in MW

Description	2000-01	2001-02	2002-03
Thermal	6425	6425	6425
Hydro	2430	2434	2434
Gas	912	912	912

Figure 3.1 MSEB generation by type in Million Units



#### D. ELECTRICITY SALES BY CONSUMER CATEGORY

As the consumer base of MSEB and TPC and REL is quite diverse, the average realization of tariff is quite different. Table 3.2 reports the number of consumers, Million Units sold to each category and Average realization for MSEB. Table 3.3 reports the consumer category-wise sales for TPC and REL.

**Table 3.2 MSEB Consumer Base and Sales in Million Units**

Consumer Category	2001-02			2002-03		
	No. of Consumers	Units Sold (MkWh)	Avg. Realization (Rs./Unit)	No. of Consumers	Units Sold (MkWh)	Avg. Realization (Rs./Unit)
Interstate	4	62	5.39	4	17	1.94
Domestic	9349683	7282	2.36	9580048	7411	2.66
Commercial	1056211	1636	4.72	1098082	1643	4.92
Industrial L and M V	297612	2856	3.78	302216	3193	3.39
Industrial HV	8770	11822	4.15	8681	12400	3.97
Public Lighting	58783	557	2.20	62410	576	2.38
Traction	472	928	3.92	483	1011	3.86
Irrigation and Agricultural HT & LT	2224351	8310	1.22	2213668	10202	1.22
Public water works & Sewerage Pumping HT & LT	46125	1192	3.32	46324	1387	2.53
Controlled Stations giving bulk supply	2	3812	4.01	2	3774	3.82
Military HT & LT	508	278	3.25	506	287	2.83
Total	13042521	38735		13312424	41901	

**Table 3.3 TPC and REL Consumer Base and Sales in Million Units**

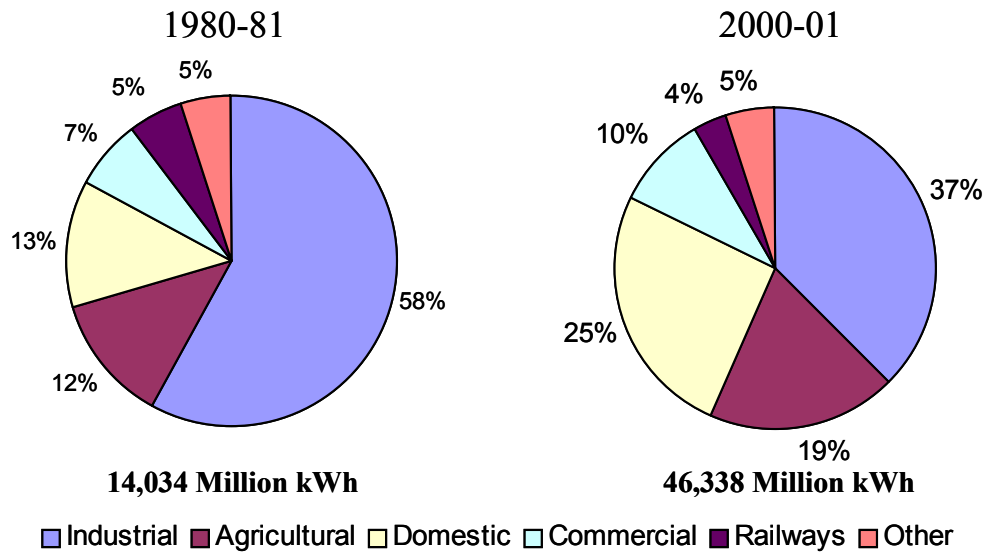
CONSUMER CATEGORY	ACTUAL SALES TPC (in MU)		ACTUAL SALES REL (in MU)	
	FY 2002-03	FY 2003-04	FY 2002-03	FY 2003-04
<b>Low Tension Category</b>				
LT Residential (LF-1)	29	45	3118	3195
Non Residential (LF-2)			1162	1281
LT (LTP1,LTP2,LTP3)	143	241	681	670
Film Studio LT	NA	NA	1	1.3
LT Cinema	NA	NA	1.4	0.5
Agriculture	NA	NA	0.04	0.06
Street Lights	NA	NA	54	56
Temporary	NA	NA	61	60
<b>High Tension Category</b>				
HTP	734	763	380	398
Bulk (HT)	NA	NA	203	272
Hotels(HT)	NA	NA	181	146
HT Housing	NA	NA	36	37
Film Studio HT	NA	NA	0.6	1
Textiles (HT)	455	363	NA	NA
Railways	736	757	NA	NA
BEST	3781	3883	NA	NA
BSES	3242	3072	NA	NA
Sales to MSEB/Other States	711	650	NA	NA
<b>TOTAL SALES</b>	<b>9832</b>	<b>9775</b>	<b>5880</b>	<b>6118</b>

## E. DEMAND CHARACTERISTICS

Over the last few decades, economic growth, liberalization and rapid expansion of urban areas have affected the electricity consumption patterns in Maharashtra significantly. Figure 3.2 below<sup>5</sup> gives the sector-wise break-up of electricity consumption over 20 years. It is important to note here that, total consumption has more than trebled in the two decades. This growth is likely to continue well into the future, as 100% electrification was achieved only in 1991 and demand will continue to grow at a fast pace. It is evident that share of the industrial sector has dipped considerably from 57.9% to 37.6%, while share of the domestic sector has increased almost ten-fold from 2.7% to 25.7%. The agricultural and commercial sectors have also increased their consumption by 6% and 3% respectively.

<sup>5</sup> MSEB Annual Report 2000-01 ([www.msebindia.com](http://www.msebindia.com))





**Figure 3.2 Changing Shares of Electricity by Consumer Class in Maharashtra**

According to MEDA<sup>6</sup>, Maharashtra being a leading industrial state in India with almost 29,000 registered factories, has an immense energy saving potential in the industrial sector of around 4590 million units (the range varying from 8% to 10% in iron and steel refineries, etc., to 25% in pulp and paper). This can avoid 720 MW thermal power capacity addition target at 70% plant load factor (PLF). This does not include further saving that is possible through major technology changes. This potential could be realized through measures whose capital and life cycle costs are less than that needed to generate equivalent amounts of energy.

As a part of this study, one key recommendation on developing system load shape data for the MSEB and other utilities is being made. As representative sample, Figure 3.3 reports the system and residential sector load profile data that was published as a part of a World Bank study in 1997<sup>7</sup>.

<sup>6</sup> MEDA website ([www.mahaurja.com](http://www.mahaurja.com))

<sup>7</sup> SRC Report on "Demand and Load Curve Analysis" submitted to The World Bank in 1997

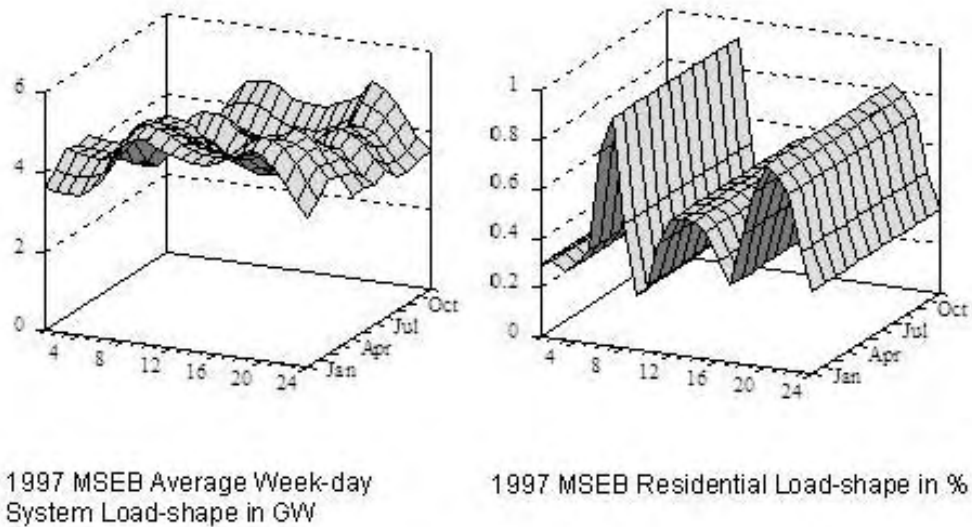


Figure 3.3 Maharashtra load shape Data from World Bank Study

## F. REGULATION AND TARIFF

With the Electricity Act 2003 in place, the regulators in Maharashtra have been actively involved in assisting the electricity sector by way of directing the utilities in setting the tariffs. Primary objective of this process has been service provision with lower tariffs in the agriculture, domestic and small businesses with a cross-subsidy offered by the commercial and industrial sectors.

## 4. THE STRATEGIC ENERGY CONSERVATION ACTION PLAN

### A. OVERVIEW

The MEDA Strategic Energy Conservation Plan has been developed as a blueprint for energy conservation activities in the State of Maharashtra, consistent with MEDA's responsibilities as the designated agency for the implementation of the Energy Conservation Act 2001 and the needs to develop mechanisms to balance the State's electricity supply and demand.

The Strategic Plan consists of the following elements:

- Statutory responsibilities of MEDA under the EC Act
- Implementation of a set of Energy Conservation Programs
- Establishment of an Energy Conservation Fund
- Development of databases and promotional campaigns
- Capacity building for development, implementation and evaluation of energy conservation programs

The Strategic Plan will be reviewed by MEDA with the State Energy Conservation Advisory Committee that includes representatives of the key stakeholders within the Maharashtra State government as well as advisors from utilities, academia and donor agencies. The Plan will be implemented by MEDA in cooperation with relevant state government agencies with participation of the private sector in the implementation process.

### B. MISSION

The mission of the State Energy Conservation Plan is:

*To develop a comprehensive approach and provide leadership in establishing and promoting the energy conservation ethic within government agencies and all consumer classes in the State of Maharashtra, while maximizing the participation of the private sector in the implementation of energy conservation activities.*

### C. OBJECTIVES

The major objectives of the Strategic Energy Conservation Plan are to”:

- Achieve substantial reductions in energy consumption and peak loads
- Balance energy supply and demand with maximum resource efficiency and reduce power shortages
- Create macro-economic and fiscal benefits to the state
- Implement cost-effective programs to enhance energy efficiency (EE) and load management (LM)
- Provide consumer information and education
- Promote private sector activities for implementation of energy conservation programs
- Protect and enhance the local, national and global environment

- Reduce long-term cost of electricity
- Reduce capital requirements for capacity expansion in the power sector

#### **D. STATUTORY RESPONSIBILITIES OF MEDA**

MEDA has been designated by the Government of Maharashtra as the designated state agency for the implementation of the EC Act 2001 in Maharashtra. This Act mandates certain specific statutory responsibilities to the designated agencies. These statutory responsibilities include various roles and functions for MEDA as a:

- Development agency
- Facilitator
- Regulatory agency

In addition, MEDA will be responsible for coordination of its activities with the Bureau of Energy Efficiency (BEE).

A discussion of the statutory responsibilities of MEDA is provided in Section 5.

#### **E. ENERGY CONSERVATION PROGRAMS**

To achieve the objectives of the Strategic Energy Conservation Plan, MEDA will develop and implement a set of proactive energy conservation programs. These programs will be implemented in cooperation with relevant state government agencies and the private sector.

MEDA has developed the preliminary designs of 10 energy conservation programs, five of which will be implemented in 2005 and the other five in 2006.

##### ***Programs to be implemented in 2005***

1. **HOME BRIGHT** – Residential High-Efficiency Lighting Program
2. **PUBLIC BUILDINGS PARTNERSHIP PROGRAM** – Energy efficiency implementation in public buildings using ESCOs as the implementing mechanism
3. **SOLAR/LPG WATER HEATING** – Integrated Solar/LPG Water Heating Program

##### ***Programs to be implemented in 2006***

4. **SME PROGRAM** – Energy efficiency improvement in small and medium enterprises
5. **WORK BRIGHT PROGRAM** – Commercial High-Efficiency Lighting Program
6. **MOTOR RE-POWER** – High Efficiency Motor Rewinding Program
7. **EE FINANCING** – Financing of energy efficiency improvement using the Energy Conservation Fund
8. **AGRICULTURAL EFFICIENCY** – Energy efficiency improvement in agriculture
9. **BRIGHT STREETS** – Municipal Street Lighting Program Using advanced technology
10. **GREEN BUILDINGS PROGRAM** – Green Buildings Program - Cooperate with existing Green Buildings Center; Construct one or two new Green Buildings in Maharashtra
11. **MUNICIPAL ENERGY EFFICIENCY PROGRAM** – Improvement of energy efficiency in municipal pumping and street lighting

A description of these programs is provided in Section 6.

## **F. ESTABLISHMENT OF AN ENERGY CONSERVATION FUND**

Many financial barriers have limited the implementation of energy efficiency activities by energy consumers in Maharashtra. Recent efforts to identify and address these barriers have concluded that there is a need for an Energy Efficiency Fund that will facilitate the development and growth of an energy efficiency infrastructure that includes energy service providers such as ESCOs to help energy consumers develop and implement cost-effective EE projects. MEDA has developed the rationale and justification for the Maharashtra Energy Conservation Fund (EC Fund), and defined the purpose and benefits of the Fund, the funding sources, use of the funds, fund management and administration, and eligibility for receiving funding for EE projects.

A discussion of the EC Fund is provided in Section 7.

## **G. DEVELOPMENT OF DATABASES AND PROMOTIONAL CAMPAIGNS**

As a part of the implementation of the Strategic EC Plan, MEDA shall develop a set of databases to support the development and implementation of EC programs, and launch a general information and education campaign to promote energy conservation activities.

The databases include the following:

- Database of large energy users
- Energy consumption and end use databases
- Load shapes database
- Database on energy efficiency technologies
- Database of certified energy managers and auditors
- Database of major stakeholders

The information and education campaign will include:

- Energy Conservation Awards
- Annual Energy Conservation Conference
- Awareness Program for Government Departments
- Awareness Program for Industry
- Awareness Program for Buildings and Commercial Establishments
- Identifying and Training Local Service Providers at the District Level
- Development of District Energy Conservation Committees

A description of these activities is provided in Section 8.

## **H. CAPACITY BUILDING**

For efficient and effective implementation of the Strategic EC Plan, MEDA will need to undertake major capacity building activities. A summary of the capacity building program is provided in Section 9.

## **5. STATUTORY RESPONSIBILITIES OF MEDA UNDER THE ENERGY CONSERVATION ACT**

### **A. THE ENERGY CONSERVATION ACT 2001**

The Energy Conservation Act, 2001 (EC Act) is by far the most important legislative initiative related to energy efficiency in India's history. The purpose of the Act is to "provide for efficient use of energy and its conservation and for matters connected therewith or incidental thereto."

The most important provision of the Act is the establishment of the Bureau of Energy Efficiency (BEE), which is designated as the responsible agency to perform a range of functions related to energy efficiency and to co-ordinate with designated consumers, designated agencies and other agencies the activities related to these functions. The Act transferred the powers and staff of the previous agency responsible for some EE activities, the Energy Management Centre, to the BEE. The Act designates certain industries as Energy Intensive Industries and imposes certain requirements on these. The Act empowers the Central Government, State Governments and the BEE with certain powers and functions that are summarized in Section B below.

### **B. POWERS OF THE CENTRAL GOVERNMENT UNDER THE EC ACT**

The Act empowers the Central Government to:

- specify the norms for processes and energy consumption standards, specify equipment and appliances, and prohibit manufacture or sale or purchase or import of equipment or appliance unless such equipment or appliances conform to energy consumption standards;
- direct the display of such particulars on labels on equipment or on appliances specified under clause (b) and in such manner as may be specified by regulations;
- specify any user or class of users of energy as a designated consumer for the purposes of this Act, and establish and prescribe such energy consumption norms and standards for designated consumers as it may consider necessary;
- direct the Energy Intensive Industries to get energy audits conducted by an accredited energy auditor and to furnish to BEE information with regard to the energy consumed and action taken on the recommendations of the accredited energy auditor;
- direct any designated consumer to designate or appoint an energy manager and submit a report at the end of the every financial year to designated agency, and prescribe minimum qualification for energy managers;
- direct every designated consumer to comply with energy consumption norms and standards and to prepare and implement a scheme for efficient use of energy and its conservation;
- prescribe energy conservation building codes for efficient use of energy and its conservation in the building or building complex, and amend the energy conservation building codes to suit the regional and local climatic conditions;
- direct building owners or occupiers to comply with the provisions of energy conservation building codes for efficient use of energy and its conservation;
- take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation, and arrange and organize training of

personnel and specialists in the techniques for efficient use of energy and its conservation; and

- take steps to encourage preferential treatment for use of energy efficient equipment or appliances.

### C. PROVISIONS FOR STATE GOVERNMENTS

The Act empowers the State governments and assigns responsibilities to them as follows:

- amend the energy conservation building codes to suit the regional and local climatic conditions;
- direct every building owner or occupier to comply with the provisions of the energy conservation building codes;
- direct any designated consumer to get energy audit conducted by an accredited energy auditor;
- designate any agency as designated agency to coordinate, regulate and enforce provisions of the Act within the State;
- take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation and arrange and organize training of personnel and specialists in the techniques for efficient use of energy and its conservation;
- take steps to encourage preferential treatment for use of energy efficient equipment or appliances; and
- direct any designated consumer to furnish to the designated agency information with regard to the energy consumed.

In addition, the Act directs the State Governments to establish a Fund called the State Energy Conservation Fund to promote the efficient use of energy and its conservation within the State.

The specific provisions of the Act are quoted below:

*“The State Government may, by notification, in consultation with the bureau –*

- *Amend the energy conservation building codes to suit the regional and local climatic conditions and may, by rules made by it, specify and notify energy conservation building codes with respect to use of energy in the buildings;*
- *direct every owner or occupier of a building or building complex being a designated consumer to comply with the provisions of the energy conservation building codes;*
- *direct, if considered necessary for efficient use of energy and its conservation, any designated consumer referred to in clause (b) to get energy audit conducted by an accredited energy auditor in such manner and at such intervals of time as may be specified by regulations;*
- *designate any agency as designated agency to coordinate, regulate and enforce provisions of this act within the state;*
- *take all measures necessary to create awareness and disseminate information for efficient use of energy and its conservation;*
- *arrange and organise training of personnel and specialists in the techniques for efficient use of energy and its conservation;*
- *take steps to encourage preferential treatment for use of energy efficient equipment or appliances;*



- *direct, any designated consumer to furnish to the designated agency, in such form and manner and within such period as may be specified by rules made by it, information with regard to the energy consumed by such consumer;*
- *specify the matters to be included for the purposes of inspection under sub-section (2) of section 17.*

*The State Government shall constitute a fund to be called the State Energy Conservation Fund for the purposes of promotion of efficient use of energy and its conservation within the state.*

*To the fund shall be credited all grants and loans that may be made by the state government or, Central Government or any other organisation or individual for the purposes of this act.*

*The fund shall be applied for meeting the expenses incurred for implementing the provisions of this act.*

*The fund created under sub-section (1) shall be administered by such persons or any authority and in such manner as may be specified in the rules made by the state government.*

*The designated agency may appoint, after the expiry of five years from the date of commencement of this act, as many inspecting officers as may be necessary for the purpose of ensuring compliance with energy consumption standards specified under clause (a) of section 14 or ensure display of particulars on label on equipment or appliance specified under clause (b) of section 14 or for the purpose of performing such other functions as may be assigned to them.*

*Subject to any rules made under this act, an inspecting officer shall have power to –*

- a. *inspect any operation carried on or in connection with the equipment or appliance specified under clause (b) of section 14 or in respect of which energy standards under clause (a) of section 14 have been specified;*
- b. *enter any place of designated consumer at which the energy is used for any activity and may require any proprietor, employee, director, manager or secretary or any other person who may be attending in any manner to or helping in, carrying on any activity with the help of energy –*
  - (i) *to afford him necessary facility to inspect –*
    - *any equipment or appliance as he may require and which may be available at such place;*
    - *any production process to ascertain the energy consumption norms and standards;*
  - (ii) *to make an inventory of stock of any equipment or appliance checked or verified by him;*
  - (iii) *to record the statement of any person which may be useful for, or relevant to, for efficient use of energy and its conservation under this act.*

*An inspecting officer may enter any place of designated consumer –*

- (a) *where any activity with the help of energy is carried on; and*
  - (b) *where any equipment or appliance notified under clause (b) of section 14 has been kept;*
- during the hours at which such place is open for production or conduct of business connected therewith.*

*The central government or the state government may, in the exercise of its powers and performance of its functions under this act and for efficient use of energy and its conservation, issue such directions in writing as it deems fit for the purposes of this act to any person, officer,*



*authority or any designated consumer and such person, officer or authority or any designated consumer shall be bound to comply with such directions.*

*Explanation – For the avoidance of doubts, it is hereby declared that the power to issue directions under this section includes the power to direct –*

- (a) regulation of norms for process and energy consumption standards in any industry or building or building complex; or*
- (b) regulation of the energy consumption standards for equipment and appliances.*

#### **D. ROLES OF MEDA UNDER THE EC ACT**

Since MEDA has been designated by the Government of Maharashtra (GoM) as the agency for implementing the EC Act, it has to assume the responsibilities listed above. The NPC study commissioned by MEDA listed three roles for MEDA:

- Development Agency
- Facilitator
- Regulatory Body

##### ***MEDA as a Development Agency***

As indicated by NPC, the key activities envisaged for MEDA as a Development agency would be

- Preparation of energy use data bank of various categories of consumers.
- Formulation of state policies and programs on Energy Efficiency.
- Promoting energy efficiency through
  - Targeted awareness programs and energy efficiency awards.
  - Publicity and advertisements for mass campaign.

##### ***MEDA as a Facilitator***

To achieve the objective of reducing wasteful energy consumption among designated consumers and implement energy efficiency measures to reduce peak power demand in the state, MEDA would have to coordinate with other state agencies/institutions and business enterprises.

The key activities under the role of facilitator would be

- Co-ordinate with BEE in implementing EC Act & EE programmes.
- Assist BEE in conducting energy managers' training and examinations.
- Promote energy efficiency through pilot / demonstration EE-DSM programmes in association with utilities companies.
- Co-ordinate with the Maharashtra Energy Regulatory Commission (MERC) for promoting energy efficiency through utility companies.
- Assist the state government in establishing an energy conservation fund.
- Evolve instruments and delivery mechanisms for implementing EE/DSM programs.
- Promote private and public partnership in efficient use of energy.

##### ***MEDA as a Regulatory Body***

BEE expects the designated consumers to take up the cause of energy efficiency voluntarily. However considering the agenda of standards and labeling, building codes and mandatory audits, a specific function as a regulator is envisaged.

The key activities for MEDA as a regulator would be

- Amend building codes as developed by BEE, to suit local requirements and enforce with in the state.
- Ensure all designated consumers have appointed certified energy managers.
- Intimate all designated consumers about mandatory energy audit and ensure that mandatory energy audits are carried out once in 3 years.
- Obtain action taken report from designated consumers.
- Prescribe energy conservation norms in manufacturing as developed by BEE and ensure compliance.
- Prescribe energy consumption standards for specific equipments as developed by BEE and enforce within the state.
- Direct mandatory display of labels on specified equipments.
- Prohibit manufacture or sale or purchase or import of such specified equipments not confirming to energy consumption standards.

#### **E. COORDINATION WITH BEE**

MEDA is required to co-ordinate with BEE for the following activities in the state of Maharashtra.

- Public awareness about EE products through media.
- Adaptation and implementation of building codes.
- Co-ordination with BEE regarding approved EE labels and products.
- Development of energy indicators for equipments, appliances and building (based on declared energy consumption data).
- Feedback to BEE on labeling and penetration of EE products.
- Role of SSIs in manufacturing EE products.
- Maintaining approved manuals and codes for EE products.
- Establishing EE product testing facilities.

## 6. ENERGY CONSERVATION PROGRAMS

### A. INTRODUCTION

The Strategic plan for Energy Conservation includes a number of Energy Conservation Programs. A list of these programs is provided below:

#### *List of Programs*

##### ***PROGRAMS TO BE LAUNCHED IN 2005***

**HOME BRIGHT** – Residential High-Efficiency Lighting Program

**PUBLIC BUILDINGS PARTNERSHIP PROGRAM** – Energy efficiency implementation in public buildings using ESCOs as the implementing mechanism

**SOLAR/LPG WATER HEATING** – Integrated Solar/LPG Water Heating Program

##### ***PROGRAMS TO BE LAUNCHED IN 2006***

**SME PROGRAM** – Energy efficiency improvement in small and medium enterprises

**WORK BRIGHT PROGRAM** – Commercial High-Efficiency Lighting Program

**MOTOR RE-POWER** – High Efficiency Motor Rewinding Program

**EE FINANCING** – Financing of energy efficiency improvement using the Energy Conservation Fund

**AGRICULTURAL EFFICIENCY** – Energy efficiency improvement in agriculture

**BRIGHT STREETS** – Municipal Street Lighting Program Using advanced technology

**GREEN BUILDINGS PROGRAM** – Green Buildings Program - Cooperate with existing Green Buildings Center; Construct one or two new Green Buildings in Maharashtra

**MUNICIPAL ENERGY EFFICIENCY PROGRAM** – Improvement of energy efficiency in municipal pumping and streetlighting

***Program Descriptions***

The description of each of these Programs on the following pages includes:

- Background
- Rationale
- Program Objectives
- Program Design
- Target Market Segments
- End Uses Targeted
- Key Barriers Addressed
- Technologies to be Employed
- Marketing Strategy
- Program Start Date
- Program Duration
- Financing Approach
- Anticipated Results
- Program Costs
- Program benefits
- Institutional Relationships
- Implementation Responsibilities
- Key Action Steps

## B. HOME BRIGHT – RESIDENTIAL HIGH EFFICIENCY LIGHTING PROGRAM

The Home Bright Program is a Residential High Efficiency Program to increase the use of Compact Fluorescent Lights and high efficiency fluorescent tube lights (efficient FTL) in homes in Maharashtra.

<b>Program Name</b>	<b>Home Bright – Residential High Efficiency Lighting Program</b>
<b>Background</b>	Residential lighting represents a large portion of the electricity consumed in the state and contributes a disproportionately large amount to the evening system peak load. Most existing households use incandescent lamps and low efficiency fluorescent tube lights (FTLs) for home lighting. High efficiency lighting technologies such as Compact fluorescent lamps (CFL) and efficient FTLs (t-8 or T-5 lamps) are available in Maharashtra but have achieved a low level of penetration. Promotion of these technologies will contribute significantly to reduced energy consumption and peak loads.
<b>Rationale</b>	<p>Both CFLs and efficient FTLs are widely available in Maharashtra. Manufacturers and/or suppliers of CFL include Philips, Osram, Sylvania, Asian Electronics and others. CFLs are an excellent example of an energy-efficient technology that can also contribute significantly to peak load reduction. Comparable total light output from a compact fluorescent scheme may be obtained for only around 20-25% of the wattage required when using standard incandescent lamps. The rated life of the compact fluorescent lamps available in Maharashtra can be 5 to 10 times longer than for incandescent lamps. Therefore CFLs can save as much as 75 to 80% of the energy used for lighting (compared to an incandescent lamp), thereby contributing significantly to reduction of the evening peak loads. Typical simple paybacks for CFLs are in the range of one year. Lamp replacement costs are reduced due to the long life. However, due to lack of knowledge and awareness of the benefits of CFLs, the high initial cost of the CFL, and the perception of risk of failure of the lamp have severely limited the purchase of these lamps in the residential sector.</p> <p>Similarly high efficiency FTL can reduce energy consumption by at least 10% (in the case of T-8 lamps) over conventional FTLs. These high efficiency lamps can fit into existing fixtures thereby making it easy to replace the conventional FTL. Also the high efficiency FTL can be combined with high efficiency electronic chokes to further reduce energy consumption,</p> <p>Therefore, the reasons for considering a residential high efficiency lighting program are:</p> <ul style="list-style-type: none"> <li>• Lighting contributes to a substantial amount to peak electric loads</li> <li>• The efficient lighting technologies can easily substitute conventional inefficient technologies.</li> <li>• The potential for reduction in energy consumption and peak load reduction is very high</li> <li>• The economics are attractive.</li> </ul>

<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Increase the penetration of CFLs and efficient FTLs in households</li> <li>• Facilitate market transformation</li> <li>• Reduce lighting energy consumption and evening peak loads</li> </ul>
<b>Program Design</b>	<p>The program will have two major components – A cooperative marketing and promotion campaign and a financing program to facilitate customer purchase of the efficient lamps.</p> <p>The first component will involve cooperative advertising and promotion of CFLs and efficient FTLs with manufacturers and/or suppliers. Participating manufacturers and suppliers will be selected using a competitive tender process that will include an assessment of the technical specifications and demonstrated performance of their products as well as their experience, financial stability, pricing and warranties. It is anticipated that the participating suppliers will provide better warranties and reduced pricing compared to those currently available in the retail market. MEDA will develop a statewide marketing and promotion campaign with the active participation (including co-funding) of the selected manufacturers and suppliers. The campaign will include the following:</p> <ul style="list-style-type: none"> <li>• Branding of the efficient technologies</li> <li>• Radio and TV advertisements</li> <li>• Newspaper advertisements</li> <li>• Leaflets, banners and other promotion media</li> <li>• Demonstration projects</li> </ul> <p>MEDA will select a marketing and promotion firm to develop the marketing and promotion strategy and design and produce the needed materials (in cooperation with the participating manufacturers and suppliers).</p> <p>In the second component MEDA will develop a financing program in cooperation with one or more private utilities (such as Tata Electric and Reliance). In this version of the program, manufacturers and suppliers will be selected competitively as in the first component. The customer will obtain the lamp from the supplier at no up-front cost and will sign an agreement with the utility to pay for the lamp over a period of time (about 9 to 12 months). The utility will collect the customer payments for the lamps through the utility bills, and will structure the monthly payments for the lamps to be lower than the customer savings from using the lamps. The utility will then reimburse the manufacturers and suppliers from the funds collected from the customers. MEDA will also consider the participation of a financial institution (or use funds from the EC Fund) to finance the sales transaction. In this design the FI will pay the manufacturers for the lamps provided to the customers and the utility will reimburse the FI as the funds are collected from the customer through the utility bills.</p>
<b>Target Market Segments</b>	Residential customers
<b>End Uses Targeted</b>	Lighting (incandescent and conventional FTL)
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• High first cost of the technology</li> <li>• Technology awareness</li> </ul>

	<ul style="list-style-type: none"> <li>• Hard-to-reach market segments</li> <li>• Data collection and evaluation</li> <li>• Financing (under the utility option)</li> </ul>																
<b>Technologies to be Employed</b>	<p>Compact Fluorescent Lamps (CFL) - CFLs will be promoted to replace incandescent lamps. The most common application of CFLs will be to replace a 60 Watt incandescent with an 11 or 12 Watt CFL, which produces the same amount of light using 20% of the energy and lasts 8 to 10 times longer.</p> <p>Efficient Fluorescent Tube Lamps (Efficient FTL or T-8 lamps) - Efficient FTLs (36 watt lamps) are priced at the same level as the standard FTL (40 watt lamps) but use 10% less energy to provide the same light output.</p>																
<b>Marketing Strategy</b>	<p>Marketing will be targeted to the following categories of market participants:</p> <ul style="list-style-type: none"> <li>• Residential customer – to increase awareness and to make them seek the product</li> <li>• Distributors and retail outlets – to encourage their participation in the program</li> <li>• Manufacturers and suppliers – to enroll them into the program</li> </ul>																
<b>Program Start Date</b>	<p>Component 1- July 1, 2005</p> <p>Component 2 – September 1, 2005</p>																
<b>Program Duration</b>	Two years																
<b>Financing Approach</b>	<p>MEDA will use its administrative funds for program design, administration, and monitoring and evaluation. MEDA and manufacturer funds will be used for cooperative advertising and promotion.</p> <p>For the utility program, the utility will pay the cost of billing and collection and the manufacturer will essentially pay the financing cost (which will be included in the lamp price).</p>																
<b>Anticipated Results</b>	Installation of 50,00,000 CFLs and 3,00,00,000 efficient FTLs in Maharashtra in 10 years																
<b>Program Costs</b>	<table> <tr> <th><u>Item</u></th><th><u>Rs. (Lakhs)</u></th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>30</td></tr> <tr> <td>Audits/Studies</td><td>10</td></tr> <tr> <td>Equipment*</td><td>3600</td></tr> <tr> <td>Training/Cap. Building</td><td>15</td></tr> <tr> <td>Total</td><td>3732</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	<u>Item</u>	<u>Rs. (Lakhs)</u>	Personnel	12	Technical Services	68	Marketing/Promotion	30	Audits/Studies	10	Equipment*	3600	Training/Cap. Building	15	Total	3732
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Equipment*	3600																
Training/Cap. Building	15																
Total	3732																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 5804 GWH</p> <p>Peak Reduction - 636 MW</p>																

<b><i>Institutional Relationships</i></b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• Banks or Financing Institutions</li> <li>• Lighting Manufacturers</li> <li>• State Government</li> <li>• Electric Utilities</li> </ul>
<b><i>Implementation Responsibilities</i></b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – Suppliers, retailers, NGOs</li> <li>• Technology Delivery – manufacturers, suppliers, ESCOs, NGOs</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>
<b><i>Key Action Steps</i></b>	<ul style="list-style-type: none"> <li>• Development of bid specifications for selection of manufacturers and suppliers</li> <li>• Tendering</li> <li>• Development of cooperative marketing and promotion campaign</li> <li>• Production of marketing and promotion materials</li> <li>• Launching of marketing and promotion campaign</li> <li>• Selection of utility for financing program</li> <li>• Detailed design of financing program</li> <li>• Launching of financing program</li> <li>• Development of program monitoring &amp; evaluation plan</li> </ul>



### C. PUBLIC BUILDINGS PARTNERSHIP PROGRAM

PUBLIC BUILDINGS PARTNESHIP PROGRAM is an energy efficiency program targeted to implementing energy efficiency measures in public buildings such as state and local government buildings.

<b>Program Name</b>	<b>Public Buildings Partnership Program</b>
<b>Background</b>	Public buildings in Maharashtra are large energy consumers. The types of buildings include government offices, schools, higher education, hospitals, military facilities, and institutional buildings. The estimated total energy consumption of these buildings is 1108 GWH and the estimated connected load is 874 MW.
<b>Rationale</b>	Substantial opportunities exist for energy efficiency improvement in public buildings. The Central Government has initiated a number of EE projects in government buildings using energy service companies (ESCOs) as implementing organizations. This approach can be applied in Maharashtra by MEDA.
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Reduce energy consumption in public buildings</li> <li>• Showcase public buildings as demonstration case studies</li> <li>• Increase awareness of public building officials on available approaches to implement energy efficiency projects.</li> </ul>
<b>Program Design</b>	<p>The program will promote energy efficiency in public buildings by promoting the use ESCOs for the implementation of energy efficiency projects. Specifically the program will develop standardized contracts for use by ESCOs and financial institutions. Additionally the program will set an objective to convert the EC Act into specific actionable targets for public buildings (e.g. 15/5 Plan – Reduce energy consumption by 15% in five years). Program Delivery</p> <p>MEDA will work with ESCOs and public building officials to identify contractual issues and mitigate them. MEDA will then work to recruit ESCOs to undertake demonstration projects that can be showcased to increase participation from public buildings.</p> <p>MEDA will work with legislators to enact laws to motivate public agencies to implement energy efficiency.</p>
<b>Target Market Segments</b>	<ul style="list-style-type: none"> <li>• Government offices</li> <li>• Schools</li> <li>• Higher education</li> <li>• Hospitals</li> <li>• Military facilities</li> <li>• Institutional buildings</li> </ul>
<b>End Uses Targeted</b>	<ul style="list-style-type: none"> <li>• Lighting</li> <li>• Cooling</li> </ul>
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Budget allocation for financing of energy efficiency measures</li> </ul>

	<ul style="list-style-type: none"> <li>• Lack of awareness of methods to finance and implement energy efficiency</li> <li>• Lack of experience with the ESCO concept</li> <li>• ESCO risk of non-payment or late payment</li> <li>• Limited motivation for public buildings to embrace energy efficiency</li> </ul>
<b>Technologies to be Employed</b>	<ul style="list-style-type: none"> <li>• High efficiency lighting</li> <li>• High efficiency air conditioning</li> <li>• Appliance and plug load efficiency improvements</li> </ul>
<b>Marketing Strategy</b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Public building decision makers – to demonstrate the value of energy efficiency measures and methods to finance and implement the installations using the private sector</li> <li>• ESCOs – to recruit ESCOs to become participants in the program.</li> <li>• Financial institutions – to encourage participation in financing public buildings EE projects</li> <li>• State government officials – to establish guidelines and targets for energy efficiency in public buildings.</li> </ul>
<b>Program Start Date</b>	July 1, 2005
<b>Program Duration</b>	Two years
<b>Financing Approach</b>	<p>MEDA shall develop and demonstrate a set of implementation and financing mechanisms for public/private partnerships to finance and implement energy efficiency projects in government buildings. While a large number of options are available for financing and implementation, MEDA shall focus on a set of generic strategies for financing and implementation.</p> <p>The alternative “models” for financing and implementation include different roles for the state government agency, a financial institution, an energy service company (ESCO) or an EPC (engineering, procurement and construction) contractor, and possibly a credit guarantee provider. The three “generic” models that can be used are similar to the models discussed above for the municipal energy efficiency program. These are discussed in detail in Appendix ____:</p> <ul style="list-style-type: none"> <li>• Model 1 - Equity financing by the state government agency, with implementation by an EPC contractor (with appropriate equipment performance guarantees).</li> <li>• Model 2 - Financing by a financial institution (FI) to the state agency, with implementation by an ESCO or an EPC contractor.</li> <li>• Model 3 - Financing by a financial institution (FI) to the ESCO with the state agency signing an energy services agreement (ESA) with the ESCO using the principles of performance contracting.</li> </ul>
<b>Anticipated Results</b>	100 public buildings energy efficiency projects in 10 years.

<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>4</td></tr> <tr> <td>Audits/Studies</td><td>100</td></tr> <tr> <td>Equipment*</td><td>1000</td></tr> <tr> <td>Training/Cap. Building</td><td>50</td></tr> <tr> <td><b>Total</b></td><td><b>1234</b></td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	4	Audits/Studies	100	Equipment*	1000	Training/Cap. Building	50	<b>Total</b>	<b>1234</b>
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Equipment*	1000																
Training/Cap. Building	50																
<b>Total</b>	<b>1234</b>																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 250 GWH</p> <p>Peak Reduction - 12 MW</p>																
<b>Institutional Relationships</b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• State government agencies</li> <li>• Public Works Department</li> <li>• Banks and Financing Institutions</li> <li>• Electric Utilities/State Electricity Board</li> </ul>																
<b>Implementation Responsibilities</b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA or Contractor</li> <li>• Technology Delivery – ESCO</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>																
<b>Key Action Steps</b>	<p>MEDA shall work with the Public Works Department and the various state government agencies to identify public buildings that would be suitable for demonstration of energy efficiency improvement. MEDA shall then:</p> <ul style="list-style-type: none"> <li>• Conduct preliminary audits</li> <li>• Identify building maintenance requirements</li> <li>• Select financing and implementation approach</li> <li>• Prepare tender documents for ESCOs</li> <li>• Conduct competitive bid process</li> <li>• Select monitoring and evaluation approach</li> <li>• Monitor projects and document results</li> </ul>																

**D. INTEGRATED SOLAR/LPG WATER HEATING PROGRAM**

<b>Program Name</b>	<b>Integrated Solar Water Heating Program</b>
<b>Background</b>	<p>The number of domestic and residential consumers serviced by Maharashtra State Electricity Board (MSEB) is around 9.6 million; Tata Power and Reliance Energy, providing electricity service in predominantly urban sectors in Maharashtra, have an additional 25% consumer base. In case of all the three utilities (MSEB, Tata Power and Reliance Energy), the peak demand is observed in two slabs, one in the morning (7 to 10 AM) and the other in the evening (6 to 9 PM). The contribution of water heating to the morning peak demand is very high. According to a 1995-96 study (conducted by SRC International for MSEB), the contribution of water heaters ranges between 5.1% (for consumption up to 50 units a month) to 23.5% (for consumption above 170 units a month). Though the residential sector shows higher average realization (Rs. 2.36 per unit in 2002-03 to Rs. 2.66 per unit in 2002-03), any savings made in the residential sector will benefit the utilities as the average cost of supply of electricity is Rs. 2.79.</p> <p>In the case of MSEB, considering average 10% consumption from the residential consumers towards water heating applications, in 2002-03 alone close to 740 Million KWH were consumed in this application. With an assumption of 10% of consumers in Maharashtra using 2 KW water heaters (geysers and immersion rods), the total installed capacity of water heating application in the Maharashtra grid is approximately 2395 MW. With an optimistic diversity/co-incidence factor of 50%, total technical off-setting potential of converting electricity-based water heating application to a combination of renewable and low-carbon intensity fossil fuel (LPG or NG for example) is estimated to be 1200 MW. Average growth in the residential sector electricity consumption is close to 7% and long-range impact of interventions in this application can be substantial.</p> <p>Several interventions have addressed this challenge promoting solar-water heating system. Due to the technological challenges related to non-occurrence days of solar energy and overnight temperature drop of close to 5 deg Centigrade, the reliability of solar-water heaters has been questioned. In order to meet the hot water requirement on the other hand, users and the system suppliers have used electrical booster systems of 2 to 2.2 KW capacities.</p>
<b>Rationale</b>	<p>The Integrated Solar Water Heating Program is targeted at improving the end-use efficiency and reducing peak electric loads by replacing the current electrical geysers or combination of SWH with electrical boosters to reliable integrated SWH systems (SWH or a combination of SWH and LPG/NG-fired instant geysers at the point of use). Through a joint effort by the utilities and suppliers, MEDA will promote the use of integrated systems in the residential sector.</p>

<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Assist utilities in Maharashtra reduce the morning peak caused due to water heating applications</li> <li>• Promote energy efficient integrated solar water heating technologies in the residential/domestic sector</li> <li>• Promote benefits of efficient water heating applications among the end-users with targeted awareness campaigns</li> <li>• Demonstrate benefits of integrated solar water heating applications by promoting testing and equipment standardization</li> </ul>
<b>Program Design</b>	<p>As the facilitating and implementing agency, MEDA will carry out the following activities:</p> <ul style="list-style-type: none"> <li>• Design and conduct sample feeder-based surveys in the residential sector to capture the current market saturation for water heaters</li> <li>• Conduct load profile study spread over different seasons to capture the demand-contribution from the residential sector</li> <li>• Carry out technology assessment for available components for integrated solar water heaters (analysis will involve evaluation of gas-fired instant water heaters)</li> <li>• Identify at least 5 feeder-based demonstration sites in Maharashtra covering the urban, peri-urban and the rural sector and develop a monitoring plan to capture utility and consumer benefits from this application</li> <li>• Design utility-driven pilot projects targeted at demonstrating the benefits at the end-use and feeder levels</li> <li>• Conduct joint awareness campaign with MSEB in the urban and peri-urban sectors to promote integrated solar water heating systems</li> <li>• Assist in implementation and monitoring of pilot projects and disseminate results to other distribution circles as a part of joint promotional campaign</li> <li>• Design and conduct training programs for artisans to develop and service integrated solar water heating systems in Maharashtra</li> <li>• Analyze fiscal impacts of integrated solar water heating systems</li> <li>• Evaluate the possibility of a joint (utilities, banks and system designers) micro-credit policy for the integrated solar water heating systems</li> </ul>
<b>Target Market Segments</b>	<ul style="list-style-type: none"> <li>• Domestic/residential sector</li> </ul>
<b>End Uses Targeted</b>	<ul style="list-style-type: none"> <li>• Water heating application in the domestic/residential sector</li> </ul>
<b>Key Barriers Addressed</b>	<p>The following are the key barriers that will be addressed to promote integrated SWH system in the domestic/residential sectors:</p> <ul style="list-style-type: none"> <li>• Promotion of electrical auxiliary heating system by suppliers</li> <li>• Lack of innovative product packaging integrating renewable and fossil fuel with low carbon-intensity</li> <li>• Lack of trained mechanics for servicing new integrated SWH products</li> <li>• High first-cost of SWH or integrated SWH systems</li> </ul>

<b>Technologies to be Employed</b>	<ul style="list-style-type: none"> <li>• High-efficiency solar water heating systems</li> <li>• Instant gas-fired (LPG or NG) water heaters</li> </ul>																
<b>Marketing Strategy</b>	<p>Program marketing will focus on the following:</p> <ul style="list-style-type: none"> <li>• Residential/domestic consumers – to promote awareness and benefits of efficient water heating system</li> <li>• Equipment suppliers – to generate interest among the private sector to promote innovative system designs in the water heating applications</li> <li>• Small businesses – to generate interest and demonstrate business opportunities to small artisans and system suppliers</li> <li>• Micro-credit organizations – to sensitize them on the importance of higher benefit/cost for utilities and re-packaging of existing renewable energy financing opportunities</li> </ul>																
<b>Program Start Date</b>	July 1, 2006																
<b>Program Duration</b>	Five years																
<b>Financing Approach</b>	<p>MEDA shall develop a program budget that can target replacement of at least 500,000 electrical water heating systems during the first phase of the program running in to two years. MEDA shall demonstrate the benefits to utilities in Maharashtra on higher recoveries and reduced stressed on the utility peak-load. MEDA shall propose a program budget to meet the additional cost of the integrated water heating system by way of effectively using the government subsidy to promote renewable energy. MEDA shall launch joint marketing campaign with the utilities and suppliers of integrated water heating system and product components to reduce its administrative expenses.</p>																
<b>Anticipated Results</b>	150,000 units installed in 10 years.																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>30</td></tr> <tr> <td>Audits/Studies</td><td>10</td></tr> <tr> <td>Equipment*</td><td>5000</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>50</u></td></tr> <tr> <td>Total</td><td>5170</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	30	Audits/Studies	10	Equipment*	5000	<u>Training/Cap. Building</u>	<u>50</u>	Total	5170
Item	Rs. (Lakhs)																
Personnel	12																
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Marketing/Promotion	30																
Audits/Studies	10																
Equipment*	5000																
<u>Training/Cap. Building</u>	<u>50</u>																
Total	5170																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 1500 GWH</p> <p>Peak Reduction - 60 MW</p>																

<b><i>Institutional Relationships</i></b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• MEDA</li> <li>• Maharashtra State Electricity Board, Tata Power and Reliance Energy</li> <li>• IREDA and other banks</li> <li>• Maharashtra Finance Department</li> <li>• Industrial Training Institute / other academic and research institutions</li> </ul>
<b><i>Implementation Responsibilities</i></b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or contractor</li> <li>• Program Delivery – MEDA or contractor</li> <li>• Technology Delivery – MEDA and industry associations</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>
<b><i>Key Action Steps</i></b>	<p><b>Developing database of domestic/residential consumption</b></p> <p>MEDA shall collect information from MSEB and other private sector utilities on feeder connected load, load profile and census of water heating system. MEDA shall collect information from various sources (including equipment manufacturers/suppliers, results of energy efficiency studies under this program/other parallel and prior projects.</p> <p><b>Designing pilot programs</b></p> <p>MEDA shall identify sub-stations in consultation with MSEB and other utilities to identify at least five distribution circles from the urban and per-urban sectors to generate feeder-level load profile and to design “integrated solar water heating program”.</p> <p><b>Marketing and awareness campaign</b></p> <p>MEDA shall initiate a marketing and awareness campaign in collaboration with MSEB and other utilities through a variety of channels:</p> <ul style="list-style-type: none"> <li>• Sensitization workshops</li> <li>• Documentation of “Innovations in Integrated Solar Water Heating”</li> <li>• Site visits</li> <li>• Instituting an award for “Most Innovative System Design” as a part of “Annual State Energy Conservation Awards”</li> </ul> <p><b>Identifying value chain for micro-credit</b></p> <p>MEDA shall communicate with different IREDA and other banks involved in extending targeted financing for renewable energy and energy efficiency and evaluate project clustering opportunities. MEDA shall also organize focused group meetings of financing organizations to develop a plan to effectively pass on financing for residential users and product developers.</p> <p><b>Training and capacity building of mechanics</b></p> <p>MEDA shall assess the current knowledge of system designers and mechanics servicing water heating units and develop a comprehensive training plan with participation from technological institutions and system suppliers in the state.</p>



## E. SMALL AND MEDIUM ENTERPRISES (SME) PROGRAM

The SME Program is targeted towards improving the productivity and lowering the specific energy costs of small and medium enterprises (SMEs) in partnership with relevant stakeholders in the State of Maharashtra.

<i>Program Name</i>	<b>Small and Medium Enterprises (SME) Program</b>
<b>Background</b>	<p>As the leading industrial State of the country, Maharashtra has more than 28000 registered industries (source: MEDA). The State's industrial production is estimated to have grown by 8.7 percent during 2003-04. This sector plays a crucial role in the rapid and balanced development of the State. The organized industrial sector of Maharashtra alone contributes to more than a fifth of the total net value added to the industrial sector at the national level. This sector represents a large potential for energy efficiency improvement, but the implementation of energy efficiency projects in this sector has been very limited.</p> <p>MEDA has been actively pursuing energy efficiency goals in the different economic sectors by supporting energy audits in about 300 industrial establishments over the last 15 years. The level of financial support extended by MEDA was Rs 20,000 for units with energy bill less than Rs 72 lakhs, and Rs 25,000 for energy bill above Rs 72 lakhs. The potentials of energy savings quoted in the energy audit reports are less than those estimated for the sub-sectors by various macro-economic studies undertaken at the national level. This is mainly because the subsidy amount is low compared to the efforts needed to conduct a detailed energy survey (energy audit cost up to Rs 50,000 for an enterprise with energy bill above Rs 72,000 represents less than 0.7% of the annual energy bill).</p>
<b>Rationale</b>	<p>SMEs are vital to the State economy because of their substantial contribution to production, employment and export while requiring relatively lower capital investments. Particularly relevant is the food processing sector related to the vast agricultural resources of the State (sugar, milk, poultry, rice, flour, edible oil, etc.). The State has only a few big integrated food processing units, all others belonging to the SME category. Textile is another promising sub-sector consisting of a large number of SMEs.</p> <p>To tackle the rapidly rising cost of energy, large and organized industries have adopted energy conservation and efficiency measures through the enhancement of technology as well as management to the extent that some industries have attained energy performance standards comparable to the international leaders. However, because of the lack of skilled technical and management personnel, poor access to relevant information and capital limitations, similar improvements have not been achieved by the SMEs. Many of these industries suffer from lower productivity due to outdated technologies, improper production management and poor operation and maintenance practices. Without adequate support, these enterprises are likely to perish in the face of the falling trade barriers, creating considerable social problems with the rapid loss of employment.</p> <p>MEDA needs to have an alternate strategy to assist much greater number of industries for achieving higher energy savings. The focus could be to</p>



	move away from supporting individual enterprises to exploring generic solutions for industrial sub-sectors and mobilizing relevant stakeholders for wider and effective dissemination of suitable solutions.
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Focus on SMEs in targeted sub-sectors to find generic solutions to the constraints of lower productivity and higher specific energy consumption</li> <li>• Ensure implementation of the identified generic solutions across a wide range of enterprises</li> <li>• Facilitate the development of a market for energy efficiency products and processes</li> </ul>
<b>Program Design</b>	<p><i>Emphasis on Productivity Improvement</i> - The program will emphasize improving the productivity of the SMEs, by promoting better management of production process, improved operation and maintenance practices and adoption of simple and cost-effective generic technological solutions. SMEs are likely to respond better to this approach which, while focusing on increasing revenues and ensuring employment of their personnel, helps to improve the efficiency of resource use (raw material, energy, etc.) and lower the generation of waste and the adverse impact on the environment.</p> <p><i>Catalytic Role of MEDA</i> - MEDA will play the catalytic role of involving the stakeholders that are closely associated with the SMEs to identify the industrial sub-sectors that contribute to high industrial production and employment creation while accounting for higher shares of energy consumption. MEDA will assist the stakeholders in defining procedure for gathering the data necessary for setting up baseline energy performance indicators to correlate the production with the energy use.</p> <p><i>Approach</i> - With the help of the sub-sectoral data available, MEDA will retain 2-3 important sub-sectors for extending support in the pilot phase. Using these data, MEDA will identify a sample of 4-6 enterprises representing various sizes, with relatively high or low specific energy consumptions. MEDA will then engage competent and experienced energy auditors to undertake comparative studies in these sample industries to identify the technical and non-technical reasons for the variations in performances and to retain feasible and generic solutions on the basis of cost-benefit analyses.</p> <p>MEDA will interact with manufacturers and vendors of energy efficient products and processes, ESCOs and financial intermediaries to help set up demonstration of suitable technologies and best practices that have considerable replication potential in the selected sub-sectors. The relevant stakeholders will be supported to widely disseminate the results of the pilot phase of activity to the targeted industrial sub-sectors, mainly through practical training workshops.</p>
<b>Target Market Segments</b>	<p>Target market segments will be selected from the following major industrial sub-sectors:</p> <ul style="list-style-type: none"> <li>• Chemical and chemical products</li> <li>• Food products</li> <li>• Refined petroleum products</li> <li>• Machinery and equipment</li> <li>• Textiles</li> </ul>

	<ul style="list-style-type: none"> <li>• Basic metals</li> <li>• Motor vehicles, trailers</li> <li>• Furniture</li> </ul>
<b>End Uses Targeted</b>	The end uses targeted will include both generic end uses common to various industries such as motors, lighting, boilers, heat recovery, refrigeration, fans and pumps, etc. as well as process-specific applications such as process integration, heat recovery, process technology and equipment upgrades, cogeneration, etc.
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Lack of skilled technical and management personnel in the SMEs</li> <li>• Poor access to technical information, industrial benchmarks and best practices</li> <li>• Investment bias towards expanding production capacity and oversizing equipment at the cost of efficiency</li> <li>• Focus on first costs and reluctance to adopt efficiency due to the general perception that efficiency adds to costs, risks and delays</li> </ul>
<b>Technologies to be Employed</b>	Wide range of generic as well as process-specific technologies that are cost-effective and have large-scale replicability across the selected industrial sub-sectors.
<b>Marketing Strategy</b>	<p>Program marketing activities will focused on the following:</p> <ul style="list-style-type: none"> <li>• Information and education for SME owners and managers in the selected industrial sub-sectors – to convince them that energy efficiency goals go hand in hand with enhanced productivity, higher profits and less adverse impact on the environment</li> <li>• Development of a cadre of experienced energy auditors – to motivate them to form a team composed of experts with the required skills for undertaking comparative studies in different SMEs and deriving generic cost-effective technological solutions</li> <li>• Cooperative marketing and promotion with manufacturers and vendors of energy efficient products and processes – to ensure their involvement to trigger the market for energy efficiency products</li> <li>• Cooperation with agencies/organizations and financial institutions specifically catering to SMEs – to get their support for interacting with the SMEs and setting up demonstration of suitable technologies, and extending support to them in training SME personnel</li> <li>• Training seminars and workshops for SME personnel – for capacity building within the SME staffs for identification and development of energy efficiency projects.</li> </ul>
<b>Program Start Date</b>	July 1, 2005
<b>Program Duration</b>	Two years

<b>Financing Approach</b>	<p>MEDA will use its administrative funds for program design, administration, and monitoring and evaluation (including monitoring of technical performances of the pilot projects).</p> <p>EC funds will be acquired for comparative studies to be conducted by experienced energy auditors.</p> <p>Manufacturers and vendors will participate in the demonstration project by providing equipment at a lower than the market cost to those SMEs which are willing to set up pilot units. They will also cover the cost of developing and updating the technological database.</p> <p>Organizations and financial institutions specially addressing SMEs will fund the sensitization training and dissemination program.</p>																
<b>Anticipated Results</b>	The program will target average reduction in energy use of 10% in at least 500 SME firms spanning at least 3 industry sub-sectors.																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>30</td></tr> <tr> <td>Audits/Studies</td><td>25</td></tr> <tr> <td>Equipment*</td><td>1500</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>25</u></td></tr> <tr> <td>Total</td><td>1660</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	30	Audits/Studies	25	Equipment*	1500	<u>Training/Cap. Building</u>	<u>25</u>	Total	1660
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Equipment*	1500																
<u>Training/Cap. Building</u>	<u>25</u>																
Total	1660																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 600 GWH</p> <p>Peak Reduction - 20 MW</p>																
<b>Institutional Relationships</b>	<p>Institutional relationships will be maintained with the following entities:</p> <ul style="list-style-type: none"> <li>• SME owners and managers</li> <li>• Organizations and financial institutions dealing with SMEs</li> <li>• Manufacturers of energy efficiency products and processes</li> <li>• State industrial authorities</li> </ul>																
<b>Implementation Responsibilities</b>	<ul style="list-style-type: none"> <li>• Detailed Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA along with organizations dealing with SMEs</li> <li>• Technology Delivery – Manufacturers and vendors of energy efficiency products and processes</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>																
<b>Key Action Steps</b>	<ul style="list-style-type: none"> <li>• Data collection and database development</li> <li>• Undertaking comparative studies in selected enterprises</li> <li>• Setting up database of energy efficient products and processes</li> <li>• Developing demonstration projects and technological fact-sheets</li> <li>• Undertaking sensitization training of SME personnel to ensure replication of pilot initiatives</li> </ul>																

## F. WORK BRIGHT PROGRAM

WORK BRIGHT is a High Efficiency Lighting Program to increase the use of energy efficient lighting technologies including energy efficient fluorescent tubes with electronic ballasts in commercial, institutional and industrial establishments.

<b>Program Name</b>	<b>Work Bright Program</b>
<b>Background</b>	Lighting is a major contributor to commercial energy consumption and peak loads. A number of efficient lighting technologies are available but have achieved limited market penetration.
<b>Rationale</b>	Energy efficient fluorescent lamps (T-8 and T-5 lamps) can provide opportunities to reduce energy consumption and peak loads in commercial buildings. These can be combined with electronic ballasts to further reduce energy and peaks.
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Increase the penetration of high efficiency fluorescent lighting</li> <li>• Facilitate market transformation</li> <li>• Reduce lighting energy consumption and peak loads</li> </ul>
<b>Program Design</b>	The program will be an awareness and promotion program under which MEDA will offer cooperative advertising and marketing assistance to service providers including manufacturers, distributors, and installation companies to increase the market penetration of high-efficiency fluorescent lamps and electronic ballasts.
<b>Target Market Segments</b>	Commercial, industrial and institutional buildings
<b>End Uses Targeted</b>	Lighting in commercial, institutional and industrial establishments.
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Awareness of the benefits of the high efficiency technologies</li> <li>• Perception of risk with electronic ballasts</li> </ul>
<b>Technologies to be Employed</b>	<ul style="list-style-type: none"> <li>• High efficiency fluorescent lights</li> <li>• Electronic ballasts.</li> </ul>
<b>Marketing Strategy</b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Commercial and Industrial energy decision makers – to increase their awareness of the energy savings potential of the technology and to make them proactively seek out the technologies</li> <li>• Market participants including suppliers, distributors, retail outlets, ESCOs and installation companies to urge them to promote the high efficiency technologies.</li> </ul>
<b>Program Start Date</b>	July 1, 2006
<b>Program Duration</b>	Two years

<b>Financing Approach</b>	<p>MEDA will co-fund cooperative marketing and promotion campaigns with manufacturers and suppliers, who will be selected using a competitive process.</p> <p>MEDA will explore options for financing the customer purchase of these technologies with utilities and financial institutions.</p>																
<b>Anticipated Results</b>	Installation of 300 lakh efficient FTL in 10 years																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>30</td></tr> <tr> <td>Audits/Studies</td><td>10</td></tr> <tr> <td>Equipment*</td><td>24000</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>25</u></td></tr> <tr> <td>Total</td><td>24,145</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	30	Audits/Studies	10	Equipment*	24000	<u>Training/Cap. Building</u>	<u>25</u>	Total	24,145
Item	Rs. (Lakhs)																
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Audits/Studies	10																
Equipment*	24000																
<u>Training/Cap. Building</u>	<u>25</u>																
Total	24,145																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 8213 GWH</p> <p>Peak Reduction - 225 MW</p>																
<b>Institutional Relationships</b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• Manufacturers</li> <li>• Banks or Financing Institution</li> <li>• Electric Utilities</li> </ul>																
<b>Implementation Responsibilities</b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA or Contractor</li> <li>• Technology Delivery – Manufacturers, suppliers, retailers, ESCOs</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>																
<b>Key Action Steps</b>	<ul style="list-style-type: none"> <li>• Select manufacturers and suppliers for cooperative program</li> <li>• Design marketing and promotion campaign</li> <li>• Production of marketing and promotion materials</li> <li>• Launching of marketing and promotion campaign</li> </ul>																

## G. MOTOR RE-POWER PROGRAM

MOTOR RE-POWER is a program targeted to old motors. It includes the testing and certification of motor rewinding shops.

<b>Program Name</b>	<b>Motor Re-Power</b>
<b>Background</b>	Motors represent the largest end use in the industrial sector. Old motors are rewound and placed back in service. The efficiency of motors will determine the amount of energy consumption and therefore it is important to assure that the rewind shops do their job to produce rewound motors that are efficient.
<b>Rationale</b>	There are many rewind shops in Maharashtra. The quality of the rewinding done by these shops varies substantially. This program will be targeted at training and certifying motor rewind shops to assure high efficiency rewinding.
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Increase the efficiency of rewound motors</li> <li>• Test and certify motor rewinding shops</li> <li>• Ensure that motor rewinding company staff are properly trained</li> </ul>
<b>Program Design</b>	<p>The program will be a “Certification” program whereby MEDA will institute a testing and certification process for motor rewinding shops. Certified shops will be given the MEDA Certification Seal and end-users will be urged to use only certified shops for rewinding motors.</p> <p>MEDA will establish minimum testing and certification standards to earn its seal of approval. Motor Rewinding shops will be recruited into the program. MEDA will work with the shops to ensure that proper training is provided or made available to their staff. An annual recertification will be required to maintain certification.</p>
<b>Target Market Segments</b>	Rewind shops for industrial motors
<b>End Uses Targeted</b>	Motors
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Awareness of rewinding technology</li> <li>• Lack of standards for rewinding</li> <li>• Inadequate training</li> </ul>
<b>Technologies to be Employed</b>	High efficiency motor rewinding
<b>Marketing Strategy</b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Industrial end-users – to demonstrate the value of using Certified Motor Rewinding Shops in terms of product quality and efficiency</li> <li>• Motor Rewinding Shops – showing them the benefit of being a MEDA Certified Shop.</li> </ul>
<b>Program Start Date</b>	July 1, 2006
<b>Program Duration</b>	Two years
<b>Financing Approach</b>	MEDA will fund the training and certification activities

<b>Anticipated Results</b>	25,000 motors in 10 years																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>34</td></tr> <tr> <td>Marketing/Promotion</td><td>30</td></tr> <tr> <td>Audits/Studies</td><td>25</td></tr> <tr> <td>Equipment*</td><td>500</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>25</u></td></tr> <tr> <td>Total</td><td>626</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	34	Marketing/Promotion	30	Audits/Studies	25	Equipment*	500	<u>Training/Cap. Building</u>	<u>25</u>	Total	626
Item	Rs. (Lakhs)																
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Audits/Studies	25																
Equipment*	500																
<u>Training/Cap. Building</u>	<u>25</u>																
Total	626																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 1125 GWH</p> <p>Peak Reduction - 16.9 MW</p>																
<b>Institutional Relationships</b>	Institutional relationships will be required with the following entities:																
<b>Implementation Responsibilities</b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA or Contractor</li> <li>• Technology Delivery – Motor Rewinding Shops</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>																
<b>Key Action Steps</b>	<ul style="list-style-type: none"> <li>• Design training and certification program</li> <li>• Design and conduct awareness campaign</li> <li>• Conduct training</li> <li>• Implement certification program</li> </ul>																

## H. ENERGY EFFICIENCY FINANCING PROGRAM

The Energy Efficiency Financing Program is a program that works with private sector financial institutions to provide a credit guarantee to EE projects implemented by ESCOs or by project hosts. The guarantee will cover a portion of the project implementation cost ("Partial Credit Guarantee").

<b>Program Name</b>	<b>Energy Efficiency Financing Program</b>
<b>Background</b>	<p>A number of financing barriers limit the implementation of EE projects by the private sector. Financing issues include limited capital availability on the part of project hosts as well as the ESCOs seeking to implement projects, lack of understanding and an undue perception of risk on the part of financial institutions, high development and transaction costs for preparing and financing "investment grade" or "bankable" projects, and the poor creditworthiness of many project hosts.</p> <p>Many of these barriers can be addressed by the development of creative financial products such as a Partial Credit Guarantee (PCG). The International Finance Corporation and the Global Environment Facility (GEF) have successfully developed and applied the PCG approach to stimulate the markets for EE financing in Hungary and other countries in Eastern and Central Europe. The Asian Development Bank is considering the development of similar products for the Indian market in cooperation with GEF.</p>
<b>Rationale</b>	<p>A partial credit guarantee facility can reduce the risk of financing EE projects to financial institutions and encourage them to make more and larger loans to EE projects. The standardizing of project agreements and project evaluation requirements through the PCG program will help streamline the development of bankable EE projects and reduce the development and transaction costs for such projects. MEDA funds, leveraged with other funds (such as funds from ADB and GEF) can be used to provide guarantee reserves that will allow for substantial leveraging of private sector funds (from project hosts, ESCOs and financial institutions) to increase the funding for EE projects.</p> <p>The PCG facility will be combined with a technical assistance (TA) program that will increase the knowledge and awareness of financial institutions (FIs) regarding the structuring of EE projects and their benefits, and will help reduce the FIs' perceptions of risks of these projects. The TA will also provide assistance in developing new financial structures and products customized to the needs of specific market segments. The TA funds will be targeted at developing standardized energy service agreements and financing agreements and appropriate credit enhancement tools for the target market segments.</p>
<b>Program Objectives</b>	<p>The program objectives are:</p> <ul style="list-style-type: none"> <li>• Increase financing of energy efficiency projects</li> <li>• Mitigate ESCO risks and increase number of ESCO projects</li> <li>• Change the risk perceptions of financial institutions regarding energy efficiency projects</li> </ul>
<b>Program Design</b>	MEDA will use funds from the State Energy Conservation Fund (EC Fund) to provide partial credit guarantees (PCG) for 50% of the project



	<p>cost. If the customer or ESCO defaults, the financial institution will be guaranteed to receive a minimum of 50% of the payments due to the ESCO. This guarantee does not apply to any ESCO performance shortfalls in terms of savings delivered or other ESCO contractual obligations under the energy services agreement.</p> <p>MEDA will work with ESCOs and banks/financing institutions to develop a standardized credit guarantee process and agreement. The ESCO will use the guarantee as part of its project structuring effort and contractual process to complete the sale. Since the customer's credit has been enhanced and the credit risk has been reduced, the ESCO and the financial institution will be able to offer better terms to the customer. The EC Fund will charge a small fee to the financial institution for the guarantee.</p>																
<b>Target Market Segments</b>	Commercial, industrial and institutional customers																
<b>End Uses Targeted</b>	All end uses in the commercial, industrial and institutional sectors																
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Credit risk</li> <li>• Customer acceptance of ESCO projects</li> <li>• Availability of financing for ESCO projects</li> <li>• Risk perceptions of financial institutions</li> </ul>																
<b>Technologies to be Employed</b>	All high efficiency technologies applicable to the commercial, industrial and institutional end uses																
<b>Marketing Strategy</b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Banks and Financing Institutes – to recruit and educate them on the financing of EE projects</li> <li>• ESCOs – to recruit and educate them to become participants in the program</li> <li>• Customers – to encourage the use of ESCOs to implement projects</li> </ul>																
<b>Program Start Date</b>	July 1, 2006																
<b>Program Duration</b>	Five years																
<b>Financing Approach</b>	A PCG facility will be established using funds from the State EC Fund and leveraging available financing for ADB/GEF and other donors.																
<b>Anticipated Results</b>	Better implementation of the bother programs through the availability of financing.																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>30</td></tr> <tr> <td>Audits/Studies</td><td>0</td></tr> <tr> <td>Equipment*</td><td>0</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>25</u></td></tr> <tr> <td>Total</td><td>135</td></tr> </table>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	30	Audits/Studies	0	Equipment*	0	<u>Training/Cap. Building</u>	<u>25</u>	Total	135
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Audits/Studies	0																
Equipment*	0																
<u>Training/Cap. Building</u>	<u>25</u>																
Total	135																
<b>Program Benefits</b>	The program benefits are included in the other programs.																

<b><i>Institutional Relationships</i></b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• Financial institutions</li> <li>• ADB/GEF</li> <li>• Other donors</li> </ul>
<b><i>Implementation Responsibilities</i></b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA or Contractor</li> <li>• Technology Delivery – ESCO and Financing Institute</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>
<b><i>Key Action Steps</i></b>	<ul style="list-style-type: none"> <li>• Design PCG program</li> <li>• Assess relationship with ADB/GEF program</li> <li>• Define TA needs</li> <li>• Design TA program</li> <li>• Seek assistance from donors</li> <li>• Establish administrative office</li> <li>• Develop PCG agreements with FIs</li> <li>• Promote program to FIs, ESCOs, project hosts and others</li> </ul>

## I. AGRICULTURAL EFFICIENCY PROGRAM

The Agricultural Energy Efficiency Program will improve the end-use energy efficiency in the agricultural sector by changing pumping machinery through a joint effort of MSEB and MEDA using a variety of activities including promotion, training and capacity building of artisans in rewinding shops.

<b>Program Name</b>	<b>Agriculture Energy Efficiency Program</b>
<b>Background</b>	<p>Agriculture sector in Maharashtra contributes more than 20% electricity in the state with close to 10000 Million Units consumption annually. Tariff in this sector is Rs. 150/HP/year for regions where the electricity consumption is less than 1300hrs/HP/year and Rs. 180/HP/year where the electricity consumption is more than 1300hrs/HP/year. With issues related to depletion of ground water table, the agriculture pumping in the state of Maharashtra will be under higher stress. Average cost realization from the agriculture sector is 51% (MERC tariff order FY 2003-04). Agriculture sector also faces issues related to the time of supply of electricity to the farmers and social aspects linked with the night-irrigation. MSEB's measures linked to feeder segregation has also lead to distortion in the system due to illegal conversion of single phase to three phase supply with the phase converters. Adverse power factor as a result of non-standard pumping equipment and non-reliable supply voltage (with variations up to minus 30%) have resulted in system failure at the feeder and end-use. On an average, the pump-sets need to be rewound at least in a year resulting in higher cost factor inputs to the farmers. Frequent rewinding also results in inefficient pumping machinery used in the field, resulting in higher losses at the end use.</p> <p>Several studies in the agriculture sector have indicated benefits at different levels:</p> <ul style="list-style-type: none"> <li>• Higher end-use efficiency with energy efficient pump-sets, with wide-voltage variation motors</li> <li>• Increased reliability of electricity distribution with potential to increase the number of pumping hours</li> </ul> <p>Energy savings potential of close to 20 to 25% is expected with the energy efficient pump-sets. Intermediation in this sector will not necessarily result in reducing peak demand as the current supply to this sector is in the non-peak hours.</p>
<b>Rationale</b>	<p>The Agriculture Energy Efficiency Program is targeted at improving the end-use efficiency by changing the pumping machinery through a joint effort by the MSEB and MEDA through a variety of programs ranging from promotion, training and capacity building of artisans in the rewinding shops.</p>
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Improve energy efficiency in the agriculture pumping operations</li> <li>• Improve system distortions with power factor corrections</li> </ul>

	<ul style="list-style-type: none"> <li>• Promote benefits of efficient pumping system among the end-users</li> <li>• Demonstrate benefits of efficient pumping system by implementation of pilot projects</li> <li>• Integrate efficient pumping program with other system improvement programs such as the high-voltage distribution system</li> </ul>
<b>Program Design</b>	<p>As the facilitating and implementing agency, MEDA will carry out the following activities:</p> <ul style="list-style-type: none"> <li>• Collect feeder-base data on installed number of pump-sets in MSEB distribution circles</li> <li>• Carry out representative energy audits in MSEB service area targeted at understanding the end-use efficiency levels and its impact on the MSEB system</li> <li>• Facilitate designing of better standards and codes for agriculture pump-sets targeting lower losses, ability to function in the wide-voltage situations and improving power factor at the feeder and system level</li> <li>• Conduct joint awareness campaign with MSEB in the rural sector to promote efficient pump-sets</li> <li>• Design pilot projects targeted at demonstrating the benefits at the end-use and feeder levels</li> <li>• Assist in implementation and monitoring of pilot projects and disseminate results to other distribution circles as a part of joint promotional campaign</li> <li>• Design and conduct training programs for mechanics in the rewinding shops</li> <li>• Analyze fiscal impacts of in-efficient agriculture pumping</li> <li>• Promote investments in agriculture pumping system by MSEB taking advantage of existing and new micro-credit channels</li> </ul>
<b>Target Market Segments</b>	Agriculture sector
<b>End Uses Targeted</b>	Water pumping in the agriculture sector
<b>Key Barriers Addressed</b>	<p>The following are the key barriers that will be addressed to improve energy efficiency in agriculture sector:</p> <ul style="list-style-type: none"> <li>• Insufficient data on existing energy use pattern</li> <li>• Gaps in the technical design of agriculture pump-sets that results in feeder imbalance</li> <li>• Lack of trained mechanics at the re-winding shops in the rural sector</li> <li>• Lack of cash-flow in the agriculture sector to improve end-use efficiency</li> </ul>
<b>Technologies to be Employed</b>	<ul style="list-style-type: none"> <li>• Wide-voltage motors in the pumping system</li> <li>• Power factor correction units (capacitors) integrated with pump-set design</li> <li>• Winding techniques</li> </ul>

<b>Marketing Strategy</b>	<p>Program marketing will focus on the following:</p> <ul style="list-style-type: none"> <li>• Agriculture users groups – to promote awareness and benefits of efficient pumping system</li> <li>• Equipment suppliers – to generate interest among the private sector to bring necessary technology to promote efficient pumping, power factor correction</li> <li>• Small businesses – to generate interest and demonstrate business opportunities to small re-winding shops</li> <li>• Micro-credit organizations – to sensitize them on the importance of higher due diligence and promotion of better equipment in the agriculture sector</li> </ul>																
<b>Program Start Date</b>	July 1, 2005																
<b>Program Duration</b>	Two years																
<b>Financing Approach</b>	<p>MEDA shall develop a program budget that can target replacement of at least 100,000 pump-sets. MEDA shall demonstrate the benefits to MSEB and the government budgets by reduced losses from this end-use. MEDA shall propose a program budget to meet the additional cost of the efficient pump-sets by way of diverting a portion of the subsidy to this sector. MEDA shall launch joint marketing campaign with the suppliers of pump-sets and other products (capacitors and protection devices) to reduce its administrative expenses.</p>																
<b>Anticipated Results</b>	100,000 pump-sets converted to energy-efficient pump-sets in 10 years																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>136</td></tr> <tr> <td>Marketing/Promotion</td><td>100</td></tr> <tr> <td>Audits/Studies</td><td>50</td></tr> <tr> <td>Equipment*</td><td>5000</td></tr> <tr> <td>Training/Cap. Building</td><td>50</td></tr> <tr> <td><b>Total</b></td><td><b>5348</b></td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	136	Marketing/Promotion	100	Audits/Studies	50	Equipment*	5000	Training/Cap. Building	50	<b>Total</b>	<b>5348</b>
Item	Rs. (Lakhs)																
Personnel	12																
Technical Services	136																
Marketing/Promotion	100																
Audits/Studies	50																
Equipment*	5000																
Training/Cap. Building	50																
<b>Total</b>	<b>5348</b>																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 1319 GWH</p> <p>Peak Reduction - 225 MW</p>																
<b>Institutional Relationships</b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• MEDA</li> <li>• Maharashtra State Electricity Board</li> <li>• Maharashtra Finance Department</li> <li>• Maharashtra Agriculture Department</li> <li>• Industrial Training Institute / other academic and research institutions</li> <li>• National Bank for Rural Development/Other micro-credit organizations</li> </ul>																

<b>Implementation Responsibilities</b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or contractor</li> <li>• Program Delivery – MEDA or contractor</li> <li>• Technology Delivery – MEDA and industry associations</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>
<b>Key Action Steps</b>	<p><b>Developing database of agriculture consumption</b></p> <p>MEDA shall collect information from MSEB on feeder connected load, load profile and pump-census. MEDA shall collect information from various sources (including equipment manufacturers/suppliers, results of energy efficiency studies under this program/other parallel and prior projects.</p> <p><b>Designing pilot programs</b></p> <p>MEDA shall identify sub-stations in consultation with MSEB and initiate audits targeted at generating feeder-level load profile and efficiency data. Based on the results from 5 to 7 audits conducted in different geo-climatic zones in the state, MEDA shall propose pump replacement program with emphasis on system efficiency improvement at the feeder implemented directly by MSEB under other Ministry of Power programs such as APDRP/DRUM.</p> <p><b>Marketing and awareness campaign</b></p> <p>MEDA shall initiate a marketing and awareness campaign in collaboration with MSEB through a variety of channels:</p> <ul style="list-style-type: none"> <li>• Sensitization workshops</li> <li>• Documentation of “best practices” in agriculture pumping</li> <li>• Site visits</li> <li>• Instituting an award for “most efficient feeder” managed and maintained by agriculture co-operatives</li> </ul> <p><b>Identifying value chain for micro-credit</b></p> <p>MEDA shall communicate with different co-operative and micro-credit banking institutions to establish the points of influence. MEDA shall also organize focused group meetings to develop a plan to pass on the MSEB funding directed at purchasing efficient pump-sets</p> <p><b>Training and capacity building of mechanics at re-winding shops</b></p> <ul style="list-style-type: none"> <li>• MEDA shall assess the current knowledge of mechanics working at the re-winding shops and develop a comprehensive training plan with participation from technological institutions and winding material suppliers in the state.</li> </ul>

## J. BRIGHT STREETS PROGRAM

BRIGHT STREETS is an energy efficiency program targeted at implementing municipal street lighting energy efficiency measures by using advanced efficient lighting technologies.

<b>Program Name</b>	<b>Bright Streets</b>
<b>Background</b>	Streetlighting is a major contributor to municipal energy consumption and energy costs.
<b>Rationale</b>	The efficiency of existing streetlighting systems can be improved through the use of new energy efficient lighting systems combined with controls.
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Reduce energy consumption of municipal streetlighting</li> <li>• Reduce peak period loads</li> <li>• Increase awareness of municipal officials on available approaches to implement and finance municipal streetlighting efficiency projects</li> <li>• Build capacity among the staffs of municipalities for the identification, evaluation, design, implementation, and monitoring/verification of measures to improve lighting energy efficiency</li> <li>• Implement a set of pilot programs to demonstrate the approaches to and benefits of energy efficiency projects</li> </ul>
<b>Program Design</b>	<p>As the primary implementing agency, MEDA will focus its efforts on the following activities:</p> <ul style="list-style-type: none"> <li>• Develop a database on streetlighting energy utilization and costs.</li> <li>• Develop and maintain information on efficient lighting technologies and options.</li> <li>• Design and conduct information and awareness campaigns for municipal executives and engineers on the need for, the benefits of, and the options to improve streetlighting energy efficiency.</li> <li>• Develop a program for training and capacity building among municipal engineers for identification, evaluation, design, implementation, and monitoring/verification of measures to improve streetlighting energy efficiency.</li> <li>• Develop innovative implementation and financing mechanisms for municipal energy efficiency projects promoting the involvement of ESCOs and other private sector entities (equipment suppliers).</li> <li>• Implement a set of demonstration projects for municipal energy efficiency and use the results for dissemination.</li> </ul>
<b>Target Market Segments</b>	<ul style="list-style-type: none"> <li>• Municipal Corporations – 15</li> <li>• Class A Municipalities – 200</li> </ul> <p>Other local government entities – 200</p>

<b>End Uses Targeted</b>	Streetlighting																
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Lack of knowledge and information on technologies for improving streetlighting energy efficiency (EE)</li> <li>• Limited availability of capital for investing in EE</li> <li>• Poor credit ratings of many municipalities that make financing of EE difficult, especially with the private sector involvement</li> <li>• Management priorities do not focus on EE as other service provisions (health and infrastructure) take precedence</li> </ul>																
<b>Technologies to be Employed</b>	Efficient streetlighting technologies																
<b>Marketing Strategy</b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Municipal officials and commissioners – to demonstrate the value of energy efficiency measures and methods to finance and implement the installations using the private sector</li> <li>• ESCOs – to recruit ESCOs to become participants in the program.</li> <li>• Financial institutions – to encourage participation in financing municipal EE projects</li> </ul>																
<b>Program Start Date</b>	July 1, 2006																
<b>Program Duration</b>	Two years																
<b>Financing Approach</b>	MEDA shall develop and demonstrate a set of implementation and financing mechanisms for streetlighting similar to those developed for the Municipal Energy Efficiency Program.																
<b>Anticipated Results</b>	100 street lighting energy efficiency projects in 10 years.																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>12</td></tr> <tr> <td>Audits/Studies</td><td>8</td></tr> <tr> <td>Equipment*</td><td>50</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>50</u></td></tr> <tr> <td>Total</td><td>202</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	12	Audits/Studies	8	Equipment*	50	<u>Training/Cap. Building</u>	<u>50</u>	Total	202
Item	Rs. (Lakhs)																
Personnel	12																
Technical Services	68																
Marketing/Promotion	12																
Audits/Studies	8																
Equipment*	50																
<u>Training/Cap. Building</u>	<u>50</u>																
Total	202																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 639 GWH</p> <p>Peak Reduction - 35 MW</p>																
<b>Institutional Relationships</b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• Maharashtra Urban Development Department</li> <li>• All-India Institute for Local Self-Government</li> <li>• Alliance to Save Energy</li> <li>• Financial Institutions</li> </ul>																



<b><i>Implementation Responsibilities</i></b>	<ul style="list-style-type: none"><li>• Program Design – MEDA or Contractor</li><li>• Program Delivery – MEDA or Contractor</li><li>• Technology Delivery – ESCO</li><li>• Program Evaluation</li></ul>
<b><i>Key Action Steps</i></b>	<ul style="list-style-type: none"><li>• Conduct pilot audits</li><li>• Identify technologies to improve energy efficiency</li><li>• Develop and conduct awareness campaign for municipalities</li><li>• Identify private sector participation options</li><li>• Conduct training and capacity building</li><li>• Implement demonstration projects</li></ul>

## K. GREEN BUILDINGS PROGRAM

Green Buildings is a program to improve the energy efficiency of new buildings by assisting the construction of highly energy-efficient buildings in Maharashtra that satisfy the requirements to be designated as “Green Buildings”.

<b>Program Name</b>	<b>Green Buildings Program</b>
<b>Background</b>	<p>Green buildings are structures that are designed, and operated in a manner that is energy and resource efficient. Green buildings are designed to meet a wide range of objectives, including using energy, water and materials efficiently; improving employee productivity; protecting the health of building occupants; and reducing the environmental impact associated with the production of building materials, construction of the buildings and their operation and maintenance.</p> <p>Rating systems for green buildings have been developed in the U.S., U.K., and Australia. The most commonly known system is the LEED (Leadership in energy and Environmental Design) performance measurement and rating system developed by the U.S. Green Buildings Council (USGBC). This system “scores” a building using well-defined criteria related to energy efficiency, water efficiency, materials and resources, indoor environmental quality, and sustainability. Using the LEED system, the USGBC certifies buildings as “certified”, “silver”, “gold” and “platinum” levels.</p>
<b>Rationale</b>	<p>There are many benefits from green buildings, including</p> <ul style="list-style-type: none"> <li>• Lower life-cycle costs</li> <li>• Better working environment leading to higher productivity</li> <li>• Lower energy, water and O&amp;M costs</li> <li>• Reduced waste</li> <li>• Increased building value</li> <li>• Improved health of occupants</li> <li>• Better local environmental quality</li> <li>• Reduced global environmental impacts</li> </ul> <p>The Green Business Center, established by CII in cooperation with USAID, helped design and construct the first green building in India (in Hyderabad) that won the highest rating (Platinum) under the LEED system, thus demonstrating that green buildings can be built in India and can be comparable to any others in the world. With the high economic growth in Maharashtra, there is a substantial amount of new building construction. This program will lead to the construction of green buildings in Maharashtra and provide leadership for more efficient design of new buildings.</p>
<b>Program Objectives</b>	<ul style="list-style-type: none"> <li>• Reduce energy consumption in new buildings</li> <li>• Demonstrate the benefits of energy-efficient construction practices</li> </ul>

	<ul style="list-style-type: none"> <li>• Increase awareness of government and private sector building decision-makers regarding available approaches to construct energy-efficient buildings.</li> </ul>																
<b>Program Design</b>	MEDA will identify decision-makers interested in construction of energy-efficient new buildings and work with them to construct new buildings that will be certified as "Green Buildings". MEDA will collaborate with the Green Buildings Center in identifying and implementing approaches for designing and constructing green buildings in Maharashtra. MEDA will provide technical assistance in this process, including the preparation of the proposals for certification.																
<b>Target Market Segments</b>	Private and public sector new buildings																
<b>End Uses Targeted</b>	All energy end used in new buildings																
<b>Key Barriers Addressed</b>	<ul style="list-style-type: none"> <li>• Lack of knowledge of efficient construction practices</li> <li>• Technical knowledge of energy efficiency techniques and practices in new construction</li> <li>• Higher initial cost of energy efficient construction</li> </ul>																
<b>Technologies to be Employed</b>	Various energy efficiency technologies as well as renewable energy for new buildings.																
<b>Marketing Strategy</b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Government decision makers – to demonstrate the opportunities for and value of energy efficiency measures and methods in new construction</li> <li>• Private sector building decision-makers - to recruit them to construct one or more green buildings</li> <li>• Architects and engineers – to inform and educate them on energy-efficient new construction</li> </ul>																
<b>Program Start Date</b>	July 1, 2005																
<b>Program Duration</b>	Two years																
<b>Financing Approach</b>	MEDA will finance the promotional and site visit program costs using its program funds. MEDA will also offer financial assistance to project sponsors to partially offset the incremental cost of energy-efficient building design and/or construction.																
<b>Anticipated Results</b>	20 Green Buildings projects in 10 years																
<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>6</td></tr> <tr> <td>Technical Services</td><td>34</td></tr> <tr> <td>Marketing/Promotion</td><td>10</td></tr> <tr> <td>Audits/Studies</td><td>20</td></tr> <tr> <td>Equipment*</td><td>0</td></tr> <tr> <td><u>Training/Cap. Building</u></td><td><u>25</u></td></tr> <tr> <td>Total</td><td>95</td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	6	Technical Services	34	Marketing/Promotion	10	Audits/Studies	20	Equipment*	0	<u>Training/Cap. Building</u>	<u>25</u>	Total	95
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Total	95																

<b><i>Program Benefits</i></b>	The 10-year program benefits are: Energy Savings - 150 GWH Peak Reduction – 7.2 MW
<b><i>Institutional Relationships</i></b>	Institutional relationships will be required with the following entities: <ul style="list-style-type: none"> <li>• Government decision-makers for new construction</li> <li>• Private sector decision-makers for new construction</li> <li>• Architects and engineers</li> <li>• The Green Buildings Center</li> <li>• U.S. Green Buildings Council</li> </ul>
<b><i>Implementation Responsibilities</i></b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA or Contractor</li> <li>• Technology Delivery – Architects, engineers</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>
<b><i>Key Action Steps</i></b>	<ul style="list-style-type: none"> <li>• Promote green building concepts to private and public decision-makers through workshops, seminars, and individual meetings</li> <li>• Select two to three buildings as demonstration projects</li> <li>• Work with the building owners and their architects and engineers, in cooperation with the Green Buildings Center to develop energy-efficient design and to define technical assistance needs</li> <li>• Identify appropriate sources of TA and facilitate the design and construction of the green buildings by co-funding the TA</li> </ul>

## L. MUNICIPAL ENERGY EFFICIENCY PROGRAM

Municipal energy efficiency is a program to improve the energy efficiency of municipal pumping and streetlighting combined with a financing mechanism to facilitate private sector participation in program implementation.

<i>Program Name</i>	<b>Municipal Energy Efficiency Program</b>
<i>Background</i>	<p>Municipalities are major consumers of energy. The major uses of energy are electricity use for water pumping and streetlighting and the energy bills paid by municipalities are quite high. In fact, over 50% of the operating budgets for many municipalities are for electric energy, and as energy prices escalate there is likely to be increasing pressures on municipal budgets. For example, Nashik municipality has an annual energy consumption of 40 Million kWh and an annual bill of Rs. 12 Crores. In 2002-03, MSEB reported energy consumption in the Public Water Works Department as 1387 Million kWh (MSEB database, MEDA). Electricity consumption during the same period towards streetlighting was 665 Million kWh. Energy audits of municipalities conducted during the last decade have pointed out the large potential for energy efficiency improvement in the water pumping and streetlighting. However, most municipalities have not invested funds for improving energy efficiency.</p> <p>The municipal sector in Maharashtra includes close to 450 municipalities and bulk supply authorities. These are of different sizes and classifications as summarized below:</p> <ul style="list-style-type: none"> <li>• Municipal Corporations – 15</li> <li>• Class A Municipalities – 200</li> <li>• Other local government entities – 200</li> </ul> <p>Based on energy use data collected in a number of energy audits, it is estimated that the total electricity consumption is around 1050 Million kWh. The estimated total annual energy bill for these municipalities in Maharashtra is Rs. 600 Crores based on an average cost of supply of Rs. 3 per unit.</p>
<i>Rationale</i>	<p>The Municipal Energy Efficiency Program is targeted at improving the energy efficiency of municipal pumping and streetlighting. It is a cooperative effort among the Urban Development Department (UDD) and Water and Department, Government of Maharashtra and the Maharashtra Energy Development Agency (MEDA). MEDA, in addition to being the state nodal agency to promote energy conservation/renewable energy in the state, has been designated as the “Implementing Agency” to support the Energy Conservation Act 2001 (EC Act). MEDA coordinates with the Bureau of Energy Efficiency in implementation of the EC Act. A description of the key features of this program follows.</p>
<i>Program Objectives</i>	<ul style="list-style-type: none"> <li>• Reduce energy consumption of municipal pumping</li> <li>• Reduce peak loads</li> <li>• Increase awareness of municipal officials on available</li> </ul>

	<p>approaches to implement and finance municipal pumping efficiency projects</p> <ul style="list-style-type: none"> <li>• Build capacity among the staffs of municipalities for the identification, evaluation, design, implementation, and monitoring/verification of measures to improve energy efficiency</li> <li>• Implement a set of pilot programs to demonstrate the approaches to and benefits of energy efficiency projects.</li> </ul>
<b>Program Design</b>	<p>As the primary implementing agency, MEDA will focus its efforts on the following activities:</p> <ul style="list-style-type: none"> <li>• Develop a database on municipal energy utilization and costs.</li> <li>• Develop and maintain information on the technologies and options for energy efficiency improvement.</li> <li>• Design and conduct information and awareness campaigns for municipal executives and engineers on the need for, the benefits of, and the options to improve energy efficiency.</li> <li>• Develop a program for training and capacity building among municipal engineers for identification, evaluation, design, implementation, and monitoring/verification of measures to improve energy efficiency.</li> <li>• Develop innovative implementation and financing mechanisms for municipal energy efficiency projects promoting the involvement of ESCOs and other private sector entities (equipment suppliers).</li> <li>• Implement a set of demonstration projects for municipal energy efficiency and use the results for dissemination.</li> </ul>
<b>Target Market Segments</b>	<ul style="list-style-type: none"> <li>• Municipal Corporations – 15</li> <li>• Class A Municipalities – 200</li> <li>• Other local government entities – 200</li> </ul>
<b>End Uses Targeted</b>	<ul style="list-style-type: none"> <li>• Water pumping</li> <li>• Water treatment</li> <li>• Wastewater pumping</li> <li>• Wastewater treatment</li> </ul>
<b>Key Barriers Addressed</b>	<p>The following are the key barriers that will be addressed to improve energy efficiency in municipalities:</p> <ul style="list-style-type: none"> <li>• Insufficient data on existing energy use patterns</li> <li>• Lack of knowledge and information on technologies for improving energy efficiency (EE)</li> <li>• Limited availability of capital for investing in EE</li> <li>• Poor credit ratings of many municipalities that make financing of EE difficult, especially with the private sector involvement</li> <li>• Management priorities do not focus on EE as other service provisions (health and infrastructure) take precedence</li> </ul>

<b><i>Technologies to be Employed</i></b>	<ul style="list-style-type: none"> <li>• Efficient pump sets</li> <li>• Retrofitting existing pumps</li> <li>• Operational changes</li> <li>• Controls</li> </ul>
<b><i>Marketing Strategy</i></b>	<p>Marketing will be focused on the following market participants:</p> <ul style="list-style-type: none"> <li>• Municipal officials and commissioners – to demonstrate the value of energy efficiency measures and methods to finance and implement the installations using the private sector</li> <li>• ESCOs – to recruit ESCOs to become participants in the program.</li> <li>• Financial institutions – to encourage participation in financing municipal EE projects</li> </ul>
<b><i>Program Start Date</i></b>	July 1, 2005
<b><i>Program Duration</i></b>	Two years
<b><i>Financing Approach</i></b>	<p>MEDA shall develop and demonstrate a set of implementation and financing mechanisms for municipal energy efficiency projects. While a large number of options are available for financing and implementation, MEDA shall focus on a set of generic strategies for financing and implementation. MEDA shall work with the municipalities to take advantage of the financing program offered by the Maharashtra Water Department under which 23.33% of the investment capital needed for energy efficiency improvement is made available as a grant from the Water Department to the municipality</p> <p>The alternative “models” for financing and implementation include different roles for the municipality, a financial institution, an energy service company (ESCO) or an EPC (engineering, procurement and construction) contractor, and possibly a credit guarantee provider. Three “generic” models are discussed in detail in Appendix ____:</p> <ul style="list-style-type: none"> <li>• Model 1 - Equity financing by the municipality, with implementation by an EPC contractor (with appropriate equipment performance guarantees).</li> <li>• Model 2 - Financing by a financial institution (FI) to the municipality, with implementation by an ESCO or an EPC contractor.</li> <li>• Model 3 - Financing by a financial institution (FI) to the ESCO with the municipality signing an energy services agreement (ESA) with the ESCO using the principles of performance contracting.</li> </ul> <p>A brief description of each model is provided in Appendix ____.</p>
<b><i>Anticipated Results</i></b>	100 municipal energy efficiency projects

<b>Program Costs</b>	<table> <tr> <th>Item</th><th>Rs. (Lakhs)</th></tr> <tr> <td>Personnel</td><td>12</td></tr> <tr> <td>Technical Services</td><td>68</td></tr> <tr> <td>Marketing/Promotion</td><td>12</td></tr> <tr> <td>Audits/Studies</td><td>200</td></tr> <tr> <td>Equipment*</td><td>800</td></tr> <tr> <td>Training/Cap. Building</td><td>50</td></tr> <tr> <td><b>Total</b></td><td><b>1142</b></td></tr> </table> <p>*Note – Most of the equipment costs will be paid by the customer or the private sector</p>	Item	Rs. (Lakhs)	Personnel	12	Technical Services	68	Marketing/Promotion	12	Audits/Studies	200	Equipment*	800	Training/Cap. Building	50	<b>Total</b>	<b>1142</b>
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<b>Total</b>	<b>1142</b>																
<b>Program Benefits</b>	<p>The 10-year program benefits are:</p> <p>Energy Savings - 650 GWH</p> <p>Peak Reduction - 80 MW</p>																
<b>Institutional Relationships</b>	<p>Institutional relationships will be required with the following entities:</p> <ul style="list-style-type: none"> <li>• Maharashtra Urban Development Department</li> <li>• Maharashtra Water Supply and sanitation Department</li> <li>• All-India Institute for Local Self-Government</li> <li>• Alliance to Save Energy</li> <li>• Financial Institutions</li> </ul>																
<b>Implementation Responsibilities</b>	<ul style="list-style-type: none"> <li>• Program Design – MEDA or Contractor</li> <li>• Program Delivery – MEDA or Contractor</li> <li>• Technology Delivery – ESCO</li> <li>• Program Evaluation – Independent Third Party Contractor</li> </ul>																
<b>Key Action Steps</b>	<p><b><i>Development of Database on Municipal Energy Use Data</i></b></p> <p>MEDA shall collect information from the municipalities on their energy use and energy bills, and assemble a statewide database.</p> <p><b><i>Information on EE Technologies and Options</i></b></p> <p>MEDA shall collect available information from various sources (including equipment manufacturers/suppliers, prior energy audits/studies, international experience in municipal energy efficiency projects, and other appropriate sources) on the technologies and measures for improving energy efficiency in municipalities.</p> <p><b><i>Information and Awareness Campaign</i></b></p> <p>MEDA shall initiate an information and awareness program for municipal executives and engineers to educate them on municipal energy efficiency options. This program shall include:</p> <ul style="list-style-type: none"> <li>• Sensitization workshops</li> <li>• Documentation and publication of “success stories”</li> <li>• Site visits</li> <li>• Annual “Water EE” conference</li> <li>• Bi-annual newsletter targeted at corporations in local language</li> <li>• Web-based information clearinghouse showcase technologies and case studies</li> </ul> <p><b><i>Capacity Building</i></b></p>																



	<p>MEDA shall design and implement a capacity building program for municipal engineers. This program shall include:</p> <ul style="list-style-type: none"><li>• Training programs starting with “Train-the Trainers” sessions in the first year (trainers chosen from the certified energy auditors of MEDA and WSSD)</li><li>• Creation of five “Centers of Excellence” housed at the leading municipal corporations in Maharashtra (Vidarbha, Pune, Nashik-Aurangabad, Ratnagiri and Kalyan)</li><li>• Detailed documentation of case studies</li><li>• Study tours</li><li>• Preparation and publication of technical guidebooks and handbooks</li></ul>
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## M. PROGRAM RESULTS, COSTS AND BENEFITS

The three programs to be implemented in 2005 (Home Bright, Public Buildings Partnership, and Solar/LPG Water heating) will lead to peak load savings of 95.2 MW in 3 years and 708 MW in 10 years. The corresponding cumulative energy savings are estimated to be 307 GWH in 3 years and 7,065 GWH in 10 years. The total program costs over 10 years are Rs. 713 crores. Of this amount Rs. 695 crores are equipment costs which will be borne by customers and the private sector. The net costs to MEDA are Rs. 18 crores. The energy and capacity savings result in benefits of Rs. 1904 crores and Rs. 2,832 crores respectively for total benefits of Rs. 4,736 crores.

Item	Units	3-Year	10-Year
Equipment Costs	Rs. Crores	0.9	695.0
Program Costs (excl Equip)	Rs. Crores	5.4	18.0
<b>Total Costs</b>	<b>Rs. Crores</b>	<b>6.3</b>	<b>713.0</b>
<b>MEDA Costs</b>	<b>Rs. Crores</b>	<b>5.4</b>	<b>18.0</b>
Energy Savings	GWH	307.1	7,053.5
Capacity Savings	MW	95.2	708.0
Energy Benefits	Rs. Crores	82.9	1,904.4
Capacity Benefits	Rs. Crores	380.8	2,832.0
<b>Total Benefits</b>	<b>Rs. Crores</b>	<b>463.7</b>	<b>4,736.4</b>

The 11 programs included in this Plan in aggregate will lead to peak load savings of 162 MW in 3 years and 1,117 MW in 10 years. The corresponding cumulative energy savings are estimated to be 906 GWH in 3 years and 20,299 GWH in 10 years. The total program costs over 10 years are Rs. 2,933 crores. Of this amount Rs. 2,888 crores are equipment costs which will be borne by customers and the private sector. The net costs to MEDA are Rs. 45.8 crores. The energy and capacity savings result in benefits of Rs. 5,480 crores and Rs. 4,468 crores respectively for total benefits of Rs. 9,949 crores.

Item	Units	3-Year	10-Year
Equipment Costs	Rs. Crores	414.5	2,887.5
Program Costs (excl Equip)	Rs. Crores	20.4	40.0
Database & Promotion	Rs. Crores	2.4	4.5
Capacity Building	Rs. Crores	0.6	1.3
<b>Total Costs</b>	<b>Rs. Crores</b>	<b>437.9</b>	<b>2,933.3</b>
<b>MEDA Costs</b>	<b>Rs. Crores</b>	<b>23.4</b>	<b>45.8</b>
Energy Savings	GWH	907.6	20,298.5
Capacity Savings	MW	162.0	1,117.1
Energy Benefits	Rs. Crores	245.0	5,480.6
Capacity Benefits	Rs. Crores	648.1	4,468.3
<b>Total Benefits</b>	<b>Rs. Crores</b>	<b>893.1</b>	<b>9,948.9</b>

## 7. MAHARASHTRA ENERGY CONSERVATION FUND

### A. BACKGROUND

It has long recognized that energy plays a crucial role in national and state economic development. Both government and industry have publicly stated the benefits of improvement in energy efficiency. Improving the efficiency of energy extraction, conversion, transportation, distribution, and utilization can lead to significant improvements in productivity, competitiveness, and job creation. More recently, the linkages between energy and the environment and the benefits of energy efficiency for both the local and the global environment have also been recognized. Also, a number of studies have pointed out the tremendous potential for improvement of energy efficiency. However, while some of Maharashtra's leading industrial companies have made major strides in improving energy efficiency (EE), there have been limited efforts by second-tier industries (SMEs), commercial organizations and municipalities due to a number of technical, institutional and financial barriers.

Recent efforts to identify and address these barriers have concluded that there is a need for an Energy Efficiency Fund that will facilitate the development and growth of an energy efficiency (EE) infrastructure that includes energy service providers such as ESCOs to help energy consumers develop and implement cost-effective EE projects.

### B. FINANCIAL BARRIERS TO ENERGY EFFICIENCY

The major financial barriers to EE project implementation include the following:

- Most organizations in the SME, commercial and municipal market segments have limited capital resources
- Financial institutions have limited experience in lending to EE projects
- Project financing for EE projects is perceived to be highly risky by financial institutions
- The development and transaction costs for preparing and financing "investment grade" or "bankable" projects are relatively high.
- Most energy service providers such as ESCOs are undercapitalized and have limited capability to raise the needed project equity funds.
- Many of the customers targeted by ESCOs are considered to be not "creditworthy" from the perspective of financial institutions.

### C. STATE RESPONSIBILITIES UNDER THE ENERGY CONSERVATION ACT

The EC Act empowers the BEE to "promote innovative financing of energy efficiency projects" and "give financial assistance to institutions for promoting efficient use of energy and its conservation". The Act also authorizes the States to:

*"constitute a fund to be called the State Energy Conservation Fund for the purposes of promotion of efficient use of energy and its conservation within the state"*

The Maharashtra Energy Efficiency Fund (the "Fund") shall be established to assist financing of qualified energy efficiency projects. The initial capital for the Fund shall be created by national legislation as part of the EC Act. This capital shall be expanded with contributions from international donor organizations, international financial institutions (including the International Finance Corporation), local private and public financial institutions, and other international and domestic

investors.

#### **D. RATIONALE AND JUSTIFICATION**

The electricity system in Maharashtra is characterized by insufficient capacity to meet the growing demand for power, and subsidized tariffs in some sectors that lead to financial deficits for the electric utilities. Under these conditions, energy savings arising from the implementation of energy efficiency measures provide significant benefits not only to the consumers who are achieving the savings but also to the utility, the ratepayers of the utility and society as a whole. Also there are some significant fiscal and macroeconomic benefits to the Government of Maharashtra that result from the energy savings.

A study of the fiscal and macroeconomic benefits of energy efficiency was recently conducted for the State of Maharashtra by Lawrence Berkeley Laboratories under funding from USAID. The preliminary findings of this study have pointed out the following types of benefits of energy conservation:

- Consumers benefit because the energy efficiency improvement in most consuming sectors typically costs much less than the electricity tariff
- Utilities benefit because in some consuming sectors the tariff does not fully cover the cost of service and therefore the electricity saved can lead to reduced monetary losses and revenue increases if the saved electricity can be sold to higher tariff consumers
- Utilities also benefit due to reduced peak loads and deficits and therefore reduced capital needs for future capacity expansion.
- The State benefits by having to generate less capital for capacity expansion.
- Since capacity shortages are leading to supply curtailment there are additional benefits when the saved electricity can be redirected to the curtailed sectors, thereby increasing output from these sectors.
- Increased output from these sectors can lead to additional revenues from increase in sales taxes, electricity duties and other taxes.
- Further secondary economic benefits result from the increased economic activity due to the additional electricity availability.

The LBNL study pointed out that the technical potential for energy conservation (at an 80% penetration level) is 6,900 GWH or 90% of the electricity shortage of 7,833 GWH in 2002-2003. The study therefore recommends that an aggressive energy conservation effort supported by financing of the energy efficiency measures is needed in Maharashtra. These results support the establishment of an EC Fund to promote the implementation of EE projects in Maharashtra.

#### **E. PURPOSE AND BENEFITS**

The primary purpose of the Fund will be to stimulate the market implementation of cost-effective energy efficiency projects. Such projects improve the efficiency of energy systems, reduce dependence on energy imports, improve economic well being, reduce environmental damage, and increase productivity.

The Fund will achieve this objective by:

- Helping finance specific projects through debt or equity financing or by providing partial credit guarantees through financial institutions
- Contributing to the development of energy efficiency service delivery organizations (such as ESCOs)
- Developing and demonstrating model financial transactions
- Developing typical financing agreements that can be used by the private sector

- Involving local financial institutions in the transactions to build their knowledge, interest and capability for financing EE projects

## **F. INITIAL FUNDING SOURCES**

There are many possible mechanisms to develop the initial funding for this Fund, including, for example:

- levy on energy sales
- special tariffs or taxes
- general tax revenues
- fees from certification
- donor funds
- funds from public and private financial institutions

These funds can be later augmented from other sources including venture capital funds, private equity capital, etc.

## **G. USE OF FUNDS**

While some of the resources of the Fund may be used as grants to facilitate the financing of municipal or other government EE projects, it is anticipated that a majority of the fund will be set up as a "revolving fund" to provide loans, equity financing and/or loan guarantees to EE projects or to EE service delivery organizations.

Examples of financing mechanisms to be employed include:

- Grants
- Loans
- Subsidies
- Loan guarantees
- Credit guarantees
- Competitive bidding
- Cooperative advertising and promotion of EC products

## **H. FUND MANAGEMENT AND ADMINISTRATION**

Many options are available for the management and administration of the Fund, including MEDA itself, a non-governmental organization (NGO), or a professional financial manager. For most efficient functioning of the Fund, the Fund shall be established as an independent organization managed by a professional fund manager. The Fund will be designed to offer a range of financial mechanisms to facilitate the implementation of energy efficiency projects, and the grant portion of the Fund may be separated from the "revolving" portion which can be designed to earn a reasonable return to the Fund investors.

The Fund manager will operate under the direction and supervision of a Board of Directors, whose composition will be determined when the Fund is established. The Board may include representatives of:

- The Ministry of Energy, GoM
- MEDA

- Other relevant GoM Ministries
- Donor agencies contributing to the Fund
- Other investors in the Fund
- Financial institutions
- Large energy user associations (such as CII or FICCI)
- NGOs or professional associations involved in EE
- Energy services industry

The Board shall select the professional Fund Manager. The Fund manager shall be an organization or individual with substantial relevant experience in managing large funds and in project financing of energy or related projects. The Fund Manager shall be selected through competitive bidding. The compensation of the fund Manager will be performance based.

## **I. QUALIFICATIONS FOR PROJECT FINANCING**

The Fund Manager will establish and publish the minimum qualifications for projects to receive various types of financial assistance from the Fund.

Examples of qualification criteria for projects receiving financial assistance may include:

- Technically feasible.
- Cost-effective from a societal perspective
- Environmentally beneficial.
- Financially sound
- Having acceptable level of risk
- Replicable
- Contributing to the development of sustainable EE markets
- Supported by an energy audit, or a detailed project report (DPR), prepared by an accredited energy auditor.

Generally, these are projects where the expected economic benefits are greater than the costs of the project. That is, the potential projects should be those where the total cost savings from reduction in energy usage are greater than the costs of implementing the energy efficient measure(s).

## **8. DEVELOPMENT OF DATABASES AND PROMOTIONAL CAMPAIGNS**

### **A. INTRODUCTION**

As part of the Strategic Energy Conservation Plan, MEDA shall develop a set of databases to support the development and implementation of EC programs, and launch a general information and education campaign to promote energy conservation activities.

The databases include the following:

- Database of large energy users
- Energy consumption and end use database
  - Residential
  - Commercial
  - Industrial
  - Government buildings
  - Municipal
  - Agricultural
- Load shapes database
- Database on energy efficiency technologies
- Database of certified energy users and managers
- Database of major stakeholders

The information and education campaign will include:

- Energy Conservation Awards
- Annual Energy Conservation Conference
- Awareness Program for Government Departments
- Awareness Program for Industry
- Awareness Program for Buildings and Commercial Establishments
- Identifying and Training Local Service Providers at the District Level
- Development of District Energy Conservation Committees

### **B. DEVELOPMENT OF DATABASES**

MEDA shall undertake an ongoing program of developing and maintaining a set of databases. These databases will support MEDA's energy conservation programs. A brief description follows:

**Database on Major Energy Users**

<b>Type of Database</b>	<b>Major Energy Users</b>
<b>Rationale</b>	The database on energy end users is required to support MEDA's mandatory responsibility as the designated agency for the implementation of the EC Act 2001.
<b>Information Included</b>	List of major energy users that are classified by the Bureau of Energy Efficiency (BEE) as designated consumers under the EC Act to get energy audits conducted by an accredited energy auditor
<b>How Developed</b>	MEDA shall obtain the data on designated consumers from the following sources: <ul style="list-style-type: none"> <li>• Utility billing data</li> <li>• Contacts with industry associations</li> <li>• Surveys as needed</li> </ul>
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Utility data</li> <li>• Contacts with industry associations</li> <li>• Surveys as needed</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Annual</li> </ul>

**Residential Energy Consumption and End Use**

<b>Type of Database</b>	<b>Residential Energy Consumption and End Use</b>
<b>Rationale</b>	The database on residential energy consumption and end use is needed to support the development of residential sector energy conservation programs and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on number of customers by type, energy consumption, major end uses, energy-using equipment, and utilization patterns.
<b>How Developed</b>	MEDA shall obtain the data on number of customers by type from the electric utilities. Using this data MEDA shall design and conduct a customer survey to obtain statistically reliable data on appliance saturations, types of appliances and their capacities and efficiency ratings, utilization patterns, and customer decision-making regarding appliance purchase and use.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Utility data</li> <li>• Residential end use survey</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Utility data – annually</li> <li>• Surveys - every three years</li> </ul>

**Commercial Energy Consumption and End Use**

<b>Type of Database</b>	<b>Commercial Energy Consumption and End Use</b>
<b>Rationale</b>	The database on commercial energy consumption and end use is needed to support the development of commercial sector energy conservation



	programs and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on number of customers by type, energy consumption, major end uses, energy-using equipment, and utilization patterns.
<b>How Developed</b>	MEDA shall obtain the data on number of customers and annual energy consumption by customer type from the electric utilities. Using this data MEDA shall design and conduct a commercial customer survey to obtain statistically reliable data on equipment saturations, types of equipment and their capacities and efficiency ratings, utilization patterns, and customer decision-making regarding equipment purchase and use.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Utility data</li> <li>• Commercial end use survey</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Utility data – annually</li> <li>• Surveys - every three years</li> </ul>

### ***Industrial Energy Consumption and End Use***

<b>Type of Database</b>	<b>Industrial Energy Consumption and End Use</b>
<b>Rationale</b>	The database on industrial energy consumption and end use is needed to support the development of industrial sector energy conservation programs and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on number of customers by type of industry, energy consumption, major end uses, energy-using equipment, and utilization patterns.
<b>How Developed</b>	MEDA shall obtain the data on number of customers and annual energy consumption by customer type from the electric utilities. Using this data MEDA shall design and conduct an industrial customer survey to obtain statistically reliable data on equipment saturations, types of equipment and their capacities and efficiency ratings, utilization patterns, and customer decision-making regarding equipment purchase and use.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Utility data</li> <li>• Industrial end use survey</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Utility data – annually</li> <li>• Surveys - every three years</li> </ul>

### ***Government Buildings Energy Consumption and End Use***

<b>Type of Database</b>	<b>Government Buildings Energy Consumption and End Use</b>
<b>Rationale</b>	The database on government buildings energy consumption and end use is needed to support the development of energy conservation programs for government buildings and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on number of buildings by type, energy consumption, major end uses, energy-using equipment, and utilization patterns.
<b>How Developed</b>	MEDA shall obtain the data on number of buildings and annual energy

	consumption by building type from the electric utilities. Using this data MEDA shall design and conduct a survey of government buildings to obtain statistically reliable data on equipment saturations, types of equipment and their capacities and efficiency ratings, utilization patterns, and customer decision-making regarding equipment purchase and use.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Utility data</li> <li>• Government buildings end use survey</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Utility data – annually</li> <li>• Surveys - every three years</li> </ul>

### *Municipal Energy Consumption and End Use*

<b>Type of Database</b>	<b>Municipal Energy Consumption and End Use</b>
<b>Rationale</b>	The database on municipal energy consumption and end use is needed to support the development of energy conservation programs for municipalities and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on energy consumption, major end uses, energy-using equipment, and utilization patterns.
<b>How Developed</b>	MEDA shall obtain the data annual energy consumption form the municipalities in cooperation with the Urban Development Department. MEDA shall also assemble data on energy audits conducted by municipalities on their pumping and streetlighting systems to develop information on typical end uses, equipment, and opportunities for efficiency improvement.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Data from municipalities</li> <li>• Energy audits</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Consumption data - annually</li> <li>• Audit data - As available from municipalities</li> </ul>

### *Agricultural Energy Consumption and End Use*

<b>Type of Database</b>	<b>Agricultural Energy Consumption and End Use</b>
<b>Rationale</b>	The database on agricultural energy consumption and end use is needed to support the development of energy conservation programs for the agricultural sector and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on energy consumption, major end uses, energy-using equipment, and utilization patterns.
<b>How Developed</b>	MEDA shall obtain the data on number of agricultural customers and annual energy use from the electric utilities. MEDA shall design and conduct a survey of agricultural customers to obtain statistically reliable data on number and types of pump sets, their capacities and efficiency

	ratings, utilization patterns, and customer decision-making regarding equipment purchase and use.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Utility data</li> <li>• Agricultural customers end use survey</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Utility data – annually</li> <li>• Surveys - every three years</li> </ul>

### *Load Shapes Database*

<b>Type of Database</b>	<b>Load Shapes</b>
<b>Rationale</b>	The database on load shapes is needed to support the development of programs to reduce peak period loads and to monitor and evaluate the benefits of these programs.
<b>Information Included</b>	Information on hourly load shapes for major energy consuming sectors and major end uses within each sector.
<b>How Developed</b>	<p>MEDA shall develop a Load Shapes Database in two phases:</p> <p><i>Phase 1-</i> In Phase 1 MEDA shall collect data from MSEB on the system load shape, the load shapes for various regions or subdivisions, and selected load shapes for feeders that serve specific types of customers. MEDA shall also use the results of the end use surveys of residential, commercial, industrial, government buildings and agricultural customers and the data from the municipalities to develop typical load shapes for major end uses and for the sector as a whole. The combination of data from these two sources with analytical approaches will lead to the development of a preliminary load shapes database.</p> <p><i>Phase 2 –</i> In Phase 2, MEDA shall conduct metering studies to obtain the data from a statistically selected sample of customers in each consuming sector. MEDA shall also selectively meter some large end uses within each sector. The results of the metering studies will be analyzed using a load shape analysis software package to develop a consistent database on load shapes at the end use, sector, region, and system level.</p>
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Results of metered data</li> <li>• Results of end use customer surveys</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Metered data – ongoing basis</li> <li>• Surveys - every three years</li> </ul>

### *Database on Energy Efficiency Technologies*

<b>Type of Database</b>	<b>Energy Efficiency Technologies</b>
<b>Rationale</b>	The database on energy efficiency technologies required to support MEDA's role as the repository and disseminator of technical information on EC technologies and developer and implementer of programs to promote energy efficiency.
<b>Information Included</b>	List of major end use technologies and their efficiencies as well as the

	major manufacturers and suppliers of these technologies.
<b>How Developed</b>	MEDA shall obtain the data on energy efficient technologies from the following sources: <ul style="list-style-type: none"> <li>• Bureau of Energy Efficiency</li> <li>• IREDA</li> <li>• Technical journals and publications</li> <li>• Academic and research organizations such as I.I.T., TERI, PCRA, NPC, LBNL, etc.</li> <li>• Manufacturers and suppliers</li> </ul>
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Continuing scanning of above sources</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Annual</li> </ul>

#### ***Database on Certified Energy Managers and Auditors***

<b>Type of Database</b>	<b>List of Certified Energy Managers and Auditors</b>
<b>Rationale</b>	In its role as the designated agency for the implementation of the EC Act, MEDA will be monitoring the energy audits conducted by the designated consumers. MEDA shall maintain a list of energy managers and auditors certified by BEE under the EC Act, and have this list available to the designated consumers and others interested in conducting energy audits.
<b>Information Included</b>	Names, addresses and contact information for certified energy managers and auditors.
<b>How Developed</b>	MEDA shall obtain the list from the Bureau of Energy Efficiency.
<b>How Updated</b>	<ul style="list-style-type: none"> <li>• Continuing scanning of above sources</li> </ul>
<b>Frequency of Updating</b>	<ul style="list-style-type: none"> <li>• Periodic, as new managers and auditors are certified.</li> </ul>

#### ***Database on Energy Stakeholders***

<b>Type of Database</b>	<b>List of Energy Stakeholders</b>
<b>Rationale</b>	In its role as a promoter of energy conservation, MEDA shall maintain lists of parties who may have a role in the implementation of EC projects. These will include: <ul style="list-style-type: none"> <li>• Energy service companies (ESCOs)</li> <li>• Industry associations</li> <li>• Consumer groups</li> <li>• NGOs</li> <li>• Manufacturers and suppliers of EE equipment</li> </ul>
<b>Information Included</b>	Names, addresses and contact information for the above lists.
<b>How Developed</b>	MEDA shall obtain the list from various sources, including: <ul style="list-style-type: none"> <li>• Bureau of Energy Efficiency</li> <li>• IREDA</li> </ul>

	<ul style="list-style-type: none"> <li>• Industry associations</li> <li>• Publications and journals</li> <li>• Consumer groups</li> </ul>
<b><i>How Updated</i></b>	<ul style="list-style-type: none"> <li>• Continuing scanning of above sources</li> </ul>
<b><i>Frequency of Updating</i></b>	<ul style="list-style-type: none"> <li>• Annual.</li> </ul>

### C. EDUCATION AND INFORMATION PROGRAMS

The NPC study identified a set of awareness and information campaigns for various target market segments. The following discussion is adapted from the NPC report.

#### ***Energy Conservation Awards***

MEDA shall recognize the meritorious and exemplary work done by various types of energy users by giving energy conservation awards. These awards would create an interest and sense of competition among many energy users to replicate and better the efforts of the winners in adopting EC measures. The energy conservation awards will include government and public buildings, municipal corporations, manufacturers of energy efficient products and devices, as well as HT, LT industry, commercial establishments, and energy service companies and energy auditors.

#### ***Annual Energy Conservation Conference***

MEDA shall organize and conduct an annual Energy Conservation Conference. This Conference shall provide a forum for discussions among the major stakeholders in energy conservation.

#### ***Awareness Program for Government Departments and Undertakings***

It would be desirable to educate and inform officials in State of Maharashtra government departments and undertakings about the Energy Conservation Act & Energy Efficiency programs. MEDA shall organize information and education programs for different government departments in the state. This will enhance the effectiveness of MEDA's delivery across the state.

The outline of the various activities is given below:

- Preparing energy savings TIPS/Captions and posters using a professional advertising agency.
- Advertising in print media and in television in Marathi/Hindi/English.
- Advertisements through state transport systems.
- Providing posters to all state offices and electricity, water and other revenue collection offices.
- Developing training material for different groups.
- Organizing a training program in association with equipment manufacturers, ESCOS and utilities.
- Celebrating the Energy Conservation Day and the Energy Conservation Week

#### ***Awareness Program for Industry***

The industrial sector in Maharashtra is a major energy user, accounting for about 45% of the total energy consumption. This is the most organized sector among the various categories of energy consumers. Over the years industry has shown interest in adopting energy conservation measures, which are basically low cost house keeping measures, the exception being cement and paper

industries that have gone in for energy efficient technologies involving significant investment. The industry awareness programs shall include the following activities:

- Conducting 1-day workshops on “EC Act – Roles and Obligation” at major industrial centers through industry associations (About 6 workshops in total).
- Conducting Workshops on implementing Energy Efficiency Projects based on the measures identified by Certified Auditors. This would be a 2 day session and would focus on options for project implementation, including the use of ESCOs (About 10 workshops in total).

#### ***Awareness Program for Buildings and Commercial Establishments***

The implementation of energy conservation measures in buildings and commercial establishments is very limited in India, and this applies to Maharashtra too. However, the opportunities for efficiency improvement are large and building owners and managers need to be informed and educated on the technologies and implementation strategies for energy efficiency. MEDA shall develop and conduct education and awareness programs and publicity campaigns targeted to buildings and commercial establishments, including:

- Workshop on energy conservation, DSM, building codes and EC Act – Roles and Obligations for designated commercial establishments
- Promoting EE equipment at major consumer exhibitions
- Preparation and dissemination of case studies and success stories of energy efficiency projects in buildings and commercial establishments
- Preparation and distribution of publicity materials/posters.

#### ***Identifying and Training Local Service Providers at the District Level***

The consultants, electrical contractors and self employed engineers practicing at the district level shall be trained in energy management and implementation of energy efficiency measures. These individuals would act as local service providers. The local service providers would play an important role in delivery of energy efficiency services. MEDA shall organize and conduct at least 10 training programs (two days duration each).

#### ***Development of District Energy Conservation Committees***

MEDA shall initiate steps to constitute energy conservation committees at the district level, primarily to propagate and promote energy conservation in government buildings and establishments, and public institutions at the district level. The Collector or Chief Executive Officer shall be designated as the Head of the Committee, which will, include the Superintending Engineer, Public Works Dept. or HOD, Superintending Engineer Circle In-charge of Electricity Distribution District/Circle, a professional or local service provider from the area, and possibly an officer from MEDA.

MEDA shall conduct an awareness program for members of the district energy conservation committees about the EC Act and the EC programs initiated by MEDA. At a later date MEDA may form energy conservation committees at Taluka and Gram Panchayat level for similar purposes in the respective area/region. The awareness program for district energy conservation committee members would be adapted to develop an awareness programs for other officials from government departments and undertakings.

## 9. CAPACITY BUILDING

### A. Introduction

MEDA, in its role as the implementing agency for the energy conservation in the state, is expected not only to manage programs at the design, scoping, launch, implementation and monitoring stages, but also expected to promote business model of energy service delivery among its partner agencies. Capacity building program under the EC Action Plan is proposed for a variety of organizations expected to work with MEDA in program implementation. Specifically, capacity building of the energy auditors and energy services companies certified by MEDA will be a part of the capacity building initiative. In order to ensure a long-term capacity building initiative, the plan recommends collaboration with the Bureau of Energy Efficiency (BEE), Indian Institute of Technology-Bombay (IIT-B) and the National Productivity Council (NPC) in their role as trainers.

### B. Important Themes under Capacity Building

MEDA and its partner agencies will be involved in the following activities:

- Understanding of past, current and future energy consumption in Maharashtra
- Planning of utility capacity development and tariff plans
- Database management
- Understanding of current and forthcoming regulatory processes
- Market research
- Technology assessment and testing procedures
- Financial analysis related to proposed program areas
- Market promotion, advertising and outreach
- Training in conducting and evaluating audits

### C. Past and Current Capacity Building Activities

As a part of several bilateral and multi-lateral technical assistance initiatives including the USAID sponsored Energy Conservation and Commercialization (ECO II) initiative, MEDA Energy Conservation Cell members have gone through training activities. The training activities included in the past and ongoing program included the following themes:

- Background of load-research, demand-side management and utility planning
- Energy audit related to municipal water pumping and government buildings
- Energy management
- Financial management
- Project management
- Personnel management

### D. Proposed Capacity Building Programs

The MEDA EC Action Plan proposes capacity building programs in the following sectors. Table below also illustrates the scope of the capacity building program with identified trainers and participants and periodicity.

Capacity building component	Type of training (classroom/field)	Participants (MEDA staff, certified auditors, entrepreneurs, artisans)	Trainers	Periodicity (annual, bi-annual, quarterly)
Load research	Classroom Field (utility sites)	MEDA staff	IIT, NPC, international consultants	Annual
Energy audits – feeders	Classroom Field (utility sites)	MEDA staff, certified auditors	IIT, NPC, international consultants	Annual
Energy audits – industries	Classroom Field (utility sites)	MEDA staff, certified auditors	IIT, NPC, international consultants	Annual
Market research	Classroom Field (urban and peri-urban sector sites)	MEDA staff, certified auditors	International consultants, market research agencies	Bi-annual
Promotion and advertising	Classroom Field (urban and peri-urban sector sites)	MEDA staff, certified auditors	IIT, NPC, international consultants	Bi-annual
Financial analysis	Classroom	MEDA staff, certified auditors	IIT, international consultants	Annual
Program management	Classroom	MEDA staff, certified auditors	IIT, NPC, international consultants	Quarterly
Certification (aligned with BEE exams)	Classroom	MEDA staff, certified auditors	IIT, NPC, international consultants	Bi-annual



### **E. Resources and Implementation Plan**

MEDA will allocate a budget of close to Rs. 1.3 crores to be spent on the capacity building activities and will also develop a business model around the training and capacity building activity.